DOCUMENT RESUME

ED 056 063 24 TM 000 861

AUTHOR Hilton, Thomas L.
TITLE A Study of Intellectual Growth and Vocational Development. Final Report.
INSTITUTION Educational Testing Service, Princeton, N.J.
SPONS AGENCY Office of Education (DHEW), Washington, D.C. Bureau of Research.
REPORT NO PR-71-11
BUREAU NO BR-6-1830
PUB DATE Mar 71
GRANT OEG-1-6-061830-0650
NOTE 422p.

EDRS PRICE MF-$0.65 HC-$16.45
DESCRIPTORS Academic Achievement; *Career Choice; Curriculum Evaluation; *Decision Making; Dropouts; Educational Opportunities; Educational Planning; Educational Research; Environmental Influences; High School Students; *Intellectual Development; Longitudinal Studies; Parent Influence; Questionnaires; Racial Differences; Socioeconomic Background; Student Development; *Vocational Counseling; Vocational Development; *Vocational Education

ABSTRACT

This final report summarizes all phases of a completed longitudinal research program investigating intellectual growth and vocational development of students from fifth to twelfth grade. Student development over time was studied as an interaction between school, community and family, with each factor influencing career choice. Research objectives are outlined and the results are summarized with supportive data and analyses presented in the tables and appendices. For the two interview schedules and three questionnaires which are also included, see TM 000 915-916, and TM 000 862-864. (CK)

ED056063

PR-71-11

FINAL REPORT

Project No. 6-1830
Grant No. OEG-1-6-061830-0650

A STUDY OF INTELLECTUAL GROWTH AND VOCATIONAL DEVELOPMENT

THOMAS L. HILTON,
Principal Investigator

Educational Testing Service
Princeton, New Jersey

March 1971

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TM 000 861 — 864
TM 000 915
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HEALTH, EDUCATION, AND WELFARE
Office of Education
Bureau of Research

Final Report

Project No. 6-1830
Grant No. OEG-1-6-061830-0650

A Study of Intellectual Growth and Vocational Development

Thomas L. Hilton, Principal Investigator

In collaboration with:
John L. Barone
William E. Coffman
Franklin R. Evans
Norman E. Freeberg
William F. Godwin
Gerald Halpern
Deirdre A. Higgins
Martin R. Katz
Stephen P. Klein
Robert L. Linn
David E. Loye
Linda K. Morse
Lila Norris
Cathleen Patrick
Michael J. Patton
Donald A. Rock
Michael Rosenfeld
Barbara B. Rothenberg
Ingeborg U. Stiebritz
Charles E. Werts

Educational Testing Service

Princeton, New Jersey 08540

March, 1971

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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Foreword

This is the final report of a program of research conducted in two phases, the first from April 1, 1966 to January 31, 1967 and the second from November 1, 1967 to June 30, 1970. The first phase of the research was fully described in an Interim Report dated June 30, 1967. This final report focuses primarily on Phase II of the research, but the major results of Phase I are also included. Those results which are not included are summarized here and have been published elsewhere and references will be given shortly, so it is not necessary for the reader to have both a copy of the Interim Report and the Final Report.

The project was conducted as a number of smaller studies, each under the direction of an experienced researcher. Regular staff meetings, where plans were reviewed and results were discussed, along with the exchange of working papers and memoranda among the staff, provided coherence and coordination to the total effort. With a few exceptions, which also will be noted in Chapter 1, a chapter of the final report is devoted to each of the separate studies conducted. The authors of these chapters are the authors of this report. Not listed as authors are a number of people who made valuable contributions to the project: Susan C. Pierson, Eleanor Williams, and Karen Yaguda, successive administrative assistants to the director; Linda K. Morse, Barbara Rollman, Ingeborg Stiebritz, Stephen Pensak and Irene Busanovich, research assistants; Romona B. Huff and Christine Sansone, secretaries. We are indebted to the advisory committee: William Cooley, Bruce Eckland, Norman Frederiksen, Philip McPherson, Roger A. Myers, W. Benton Schrader, Benjamin Shimberg, and especially Edward Landy who served as chairman of the committee. Alice Y. Scates, the original USOE Project Officer for the study, was exceptionally helpful and her successors, Judith Weinstein and Susan Klein, have been equally so.

Thomas L. Hilton
Project Director

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Chapter 1

The Problem

Thomas L. Hilton

A major goal of American secondary education, accepted by educators and laymen alike, is the guidance of the student in the selection of and preparation for a vocation. To this end, a considerable body of theoretical and empirical work has been carried out in recent years, in an effort to increase understanding of the nature of intellectual and vocational development; yet we remain in considerable ignorance as to the nature of the interactions between the student and his environment which lead to particular educational programs or career choices. We are better informed about the career choices and educational decisions of those students who are college-bound than of those terminating their educational programs with secondary school or with a limited period of subsequent specialized vocational training. We still know very little about the nature of academic, socioeconomic, or other handicaps which may prevent certain individuals from succeeding in those programs which are available.

Continued research on the nature of intellectual and vocational development will contribute greatly to the solution of many educational problems. Knowledge is required, for example, of the major determinants of each student's choice of high school program. How does the changing pattern of each student's abilities and achievements influence this choice? When are differences among students in each curriculum first detectable? What effect does enrolling in a particular curriculum have on the student's growth in basic skill and achievement?

Very generally, our point of view is that student development involves an interaction over time between the student--his perceptions, skills, beliefs, needs, and values--and his environment, especially his family and his peers. Super's (1953) ten propositions served as the initial theoretical basis for the research, with certain modifications, which were suggested by research on career decision-making (Hilton, 1962). Super's sixth proposition is especially relevant:

> The nature of the career pattern is determined by the individual's parental socioeconomic level, mental ability, and personality characteristics, and by the opportunities to which he is exposed (1953, p. 190).

Developing this proposition into a set of specific hypotheses, and obtaining results which were relevant to them were the overall goals of this research. Achieving these goals required, first, an extended period of logical analysis and hypothesis generation; second, an extensive body of data for hypothesis testing; and, third, analytical methods capable of unraveling the complex multivariate processes which underlie the vocational development in question.

The Need for Longitudinal Data. The data requirements were, indeed, extensive. Generally speaking we were interested in how the student's attributes, in interaction with family, school, and community variables, change over time as a result of the student's experiences. For example, what effect does attending a junior high school with a particular curriculum and community socioeconomic setting have on the subsequent growth in ability and achievement of a student who lives in a particular setting and who is enrolled in a particular high school vocational program and who in junior high school exhibited a certain amount of growth?

To answer questions of this type one needs longitudinal data. And since growth in significant aspects of development is slow and not easily measured, data covering a period of years are required. Furthermore, measuring instruments were required which could be given to the same students repeatedly without producing serious ceiling or practice effects. Finally, a large and representative sample of pupils was required if we were successfully to explore the significant subgroups into which the sample naturally was divided.[1]

Fortunately, data relevant to the problem were already being collected. In 1961, in cooperation with the College Entrance Examination Board, Educational Testing Service initiated a Study of Academic Prediction and Growth, in order to obtain data by means of which the mental abilities and academic achievement of a large national sample of students could be traced over the eight-year period from the beginning of grade 5 through the end of grade 12. ETS initiated the Growth Study not only to have data to describe the intellectual development of American adolescents, but also to accumulate data necessary for longitudinal studies by the research staff--studies precisely like those to be described in the following pages.

Summary of Related Research

In reviewing the pertinent literature, studies regarding interests and abilities (Super, 1961; Tiedeman, 1952; Berdie, 1944), SES and parental influence on choice of curriculum on career (Berdie, 1943; Gribbons & Lohnes, 1964; Kahl, 1953), the influence of the school and community (Jones, 1952; Davis, Hagen, & Strouf, 1962; Flanagan et al., 1962), the bases for curriculum and career choices made by ninth-grade students (Super & Overstreet, 1960; O'Hara & Tiedeman, 1959), the stability of choices made by ninth-grade students (Ginzberg et al., 1951; Flanagan & Cooley, 1965), and the unresolved issues in vocational development (Super, Tiedeman, & Borow, 1961; Ginzberg et al., 1951), are found.

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[1] If, for example, one starts with a total sample of 40,000 and makes two sex divisions, four grade-level divisions, three SES divisions, three school-type divisions and five curriculum divisions, the resulting samples will have a mean N of about 110. For most statistical purposes at least this many cases are desirable.

Most of the studies done have been cross-sectional in design. Few have involved repeated testing of the same students' academic development and change of vocational interests from junior through senior high school. Furthermore, most of the studies have been based on samples of such limited size that it has not been possible to examine homogeneous subgroups of the sample separately. In some, for example, it has been necessary to combine boys and girls in one sample. Finally, most of the studies have not achieved as broad a coverage of abilities and achievement as is desirable. Ability and achievement have frequently been measured by means of a single instrument of limited reliability, with the result that these variables have accounted for only a small share of the variance under study.

The Growth Study is unique in that the students have been retested biennially in a variety of areas, and in that the schools from which the sample was drawn represent a broad range of U. S. school-types and curriculum combinations: schools which send 75% of their students to college as well as schools which are exclusively vocations, rural and urban schools, and schools from both culturally advantaged as well as disadvantaged areas. With the possible exception of Project Talent (which, however, does not employ the technique of repeated measurement of ability and achievement), none of the studies examined encompasses the scope, the number of variables, or the time periods found in the Growth Study.

The studies which have been done are valuable as sources of hypotheses. The working assumption of the research described in this report, however, was that repeated measurement of the achievement, aptitudes and interests of national samples is essential to rigorous hypothesis testing in vocational development research.

Objectives

The following were the original objectives of the research. Subsumed under each are certain questions of interest described in the following chapters.

Objective I: To obtain a description of the kinds of vocational educational curricula in a nationwide sample of high schools, and a description of the characteristics of the students enrolled.

a. What are the major subgroups of students within the vocational education area, and are there significant differences among these groups in ability, achievement, and certain noncognitive attributes?[2]

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[2]The phrase vocational education is commonly used in a variety of ways. In this work we used the phrase in reference to any secondary school program designed for students who do not intend to complete four years of college. Thus, we did not restrict it only to programs for which funds are provided under the several national vocational education

b. Are there significant regional or community differences in the number and the attributes of students enrolled in the different vocational programs?

Objective II: To trace the intellectual development of students who subsequently elect vocational, as opposed to college preparatory, programs in high school.

a. Do the aptitude and achievement of students in various vocational programs develop at the same rate as they do for students in college preparatory programs?

b. Are there achievement differences at the 7th grade level between those who at the 9th grade level elect vocational programs and those who elect college preparatory programs? (This question can be investigated only at schools where a choice is made at the 9th grade level.)

c. Can choice of high school program be predicted from these 7th grade achievement differences?

d. Are there differences at the 7th grade level in family background and school characteristics between students who elect a vocational program as compared with a college preparatory program, that are not accounted for by a factor of general ability?

e. If differences are found in family background and school characteristics at the 7th grade level, do the same differences exist at the 5th grade level?

f. Can choice of high school curriculum be predicted from differences among the students at the 5th grade level?

g. How early does a student decide or come to know which curriculum he will take in high school?

h. To what extent does he make a deliberate "choice" as opposed to having a choice result from environmental circumstances?

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acts. We recognized, however, that testing certain hypotheses required that distinctions be made within the vocational educational area (between home economics and business education, for example). Furthermore, as Conant has pointed out, "anything that is said or written on the subject of vocational education must be considered in connection with the state in which the high school is located" (1959, p. 127). Accordingly, before the data from school systems in different states were pooled we tried to make sure that the sample parameters were comparable.

i. Does the 7th grade choice or expectation in regard to high school program have any observable relationship with intellectual development? In other words, is the change in test scores from the 7th to the 9th grade of students who anticipate a vocational program different from the change of students who anticipate a college preparatory program?

j. Do differences between vocational and college preparatory groups in 9th or 11th grade test performance exist when initial differences in ability and achievement, background, and school characteristics are held constant?

k. How stable are early (7th grade) expectations in regard to high school programs? Which students change plans, and what are their characteristics? Is there any relationship between change in plans and enrollment in particular programs?

l. Are changes in the students' backgrounds and experiences in the 7th to 9th grade period and in the 9th to 11th grade period associated with changes in the students' vocational aspirations?

Objective III: To investigate the interaction of stated vocational plans, academic preparation, individual characteristics, and subsequent educational or vocational involvement.

a. What are the characteristics of students whose plans are congruent with subsequent involvements, and those whose plans are not, i.e., those whose plans do not materialize?

b. Are characteristics of the schools related to this congruence or lack of it?

Objective IV: To relate the appropriateness of student planning in terms of post-high school educational or vocational involvement to characteristics of the secondary school he attended, including the curriculum in which he was enrolled.

a. What school characteristics are associated with more appropriate planning?

Objective V: To develop a preliminary theoretical model of vocational development, covering the years from 5th to 12th grade.

a. What are the critical variables in such a model?

b. Given the specific student, family and school characteristics, what predictions can be made concerning the proportions of students in particular schools who elect vocational programs as opposed to college preparatory programs?

c. Do the data fit predicted proportions? What conditions appear to account for discrepancies between predictions and observations?

The preceding were the original objectives of the project. As every project proceeds, however, the objectives undergo revisions. Some objectives prove to be unrealistic and are reformulated or postponed for future research. Others are found to require much more emphasis and articulation than in the original proposal. Or needs are discovered which were not emcompassed under the original objectives, and new objectives are created. The experience of this project was no exception. The description of the research studies which follows constitutes the best description of the evolving changes in the project's objectives, but a few generalizations can be offered here. First, there should have been in the list of objectives a sixth objective stated something like the following:

Objective VI: To develop the statistical methods necessary for the analysis of data on student development.

Repeatedly, when a member of the Vocational Development staff undertook the design of a study to answer one of the questions listed on the previous pages, he would find that existing techniques were so inadequate as to cause him to postpone the substantive research indefinitely and to concentrate on developing the necessary techniques. The methodological work by Freeberg and Rock (Appendix A), Katz (Appendix C), Rock and Evans (Chapter 10), Werts (Appendix B) are examples.

Objective VII: To investigate the influence of school, community and regional variables on educational decision-making and student achievement within the school.

The staff frequently observed differences in the mean achievement among schools without any obvious explanation for these differences. In pursuit of possible explanations, one staff member did what might be described as a clinical study of three schools which by many criteria were similar: they were approximately the same size, had fully adequate physical plants, roughly comparable curriculum offerings, and comparable teaching staffs. Some ways in which the schools differed and the possible effect of these differences on achievement are described in Chapter 7 by Casserly and Coffman.

Still another objective would have been as follows:

Objective VIII: To investigate the possible causes of school withdrawals.

Early in the project, the staff realized it was possible to supplement the project's extensive file or data on each student's achievements with data on an equally important educational outcome, namely, whether the student remained in school through high school. This drop-out study by Evans and Patrick is described in Chapter 9.

Lastly, the following objective should have been included:

Objective IX: To compare the achievement of Negro and white students within different academic programs in different schools.

This project was undertaken with the encouragement of the Bureau of Research, in part to see whether the achievement differences observed in the cross-sectional data of the Coleman study would be observed in the longitudinal data of the Growth Study. Chapter 8 by Rosenfeld and Hilton describes the results.

Having described some of the additions to the original objectives of the project, let us now mention some deletions or, if not deletions, some objectives which received less attention than originally anticipated.

The most notable absence from this final report is a chapter concerning a theoretical model of vocational development. Theoretical considerations entered into the design of most of the substudies conducted, and the discussions of results frequently involved theoretical issues, but the staff did not attempt to integrate these thoughts into a theoretical model, not because this was not regarded as desirable, but because it was regarded as premature. A well-developed theoretical model is sorely needed, but if such a model is to be any more than a superficial collection of speculations, a large investment of high-level staff time will be required.

A second omission from this final report concerns school characteristics which are associated with "more appropriate planning" (Objective IV). The staff originally hoped to be able to characterize students on the basis of follow-up information in accordance with the apparent success of their vocational preparation and planning, and then to look back at the high schools they attended to see if the schools attended by the more successful students were different in any measurable ways from those attended by the less successful students. In retrospect, however, this objective is like the goal of developing a theoretical model--a noble objective, but not a practical one given the present state of the art of criterion development. The problem is primarily one of time span. Who is to say that one student has been more successful than another on the basis of his experiences one to three years after being graduated from high school?

Also, who is to say that a given student should go to college? We tend to assume in our U. S. culture that any young person who has the ability should in his own interest and in the country's interest go to college. But how justified is this assumption? Suppose that a highly able young man in a college preparatory program decides that what he really wants to do is attend a two-year technical school and become a television service man. Are we, as researchers, to categorize him as vocationally maladjusted, or as having been inappropriately educated given his vocational choice? The authors of this report, at least, were wholly unwilling to make such a value judgment. The approach taken by the staff was, rather, a more descriptive one, in which the post-high school education and occupation of the subjects are described and related to their earlier educational experiences. Chapter 11 describes these results.

The reader will, then, not find in this report specific suggestions for the reformulation of public school course-offerings or suggestions for the restructuring of public school education. We view the work, rather, as basic educational research, designed to throw light on some

of the critical questions which underlie day-to-day operational and policy questions in the schools. The questions critically need answers. The research staff would hope that the studies reported in the following chapters will contribute eventually to such answers.

Chapter 2

The Sample, Data, and Procedures

In view of the longitudinal nature of most of the research's objectives it was critical to have longitudinal data for the investigation. Hilton and Patrick (1970), for example, demonstrated that observed growth rates depend importantly on school attrition rates from grade 5 to grade 11. Except under special conditions, which rarely hold, cross-sectional data are not a satisfactory substitute for longitudinal data. Fortunately, the staff had access to the extensive data files of the Growth Study and relied heavily on those files in conducting the current investigation.

Testing Plan. The testing plan for the Growth Study is shown in detail in Figure 1. From the figure, one can see that it incorporates both a cross-sectional and a longitudinal design, i.e., in 1961 different students in grades 5, 7, 9, and 11 were tested, and since then the same students were tested every two years until they were graduated.

Sample. The 17 communities participating in the Growth Study and the names of their high schools, totaling 27, are shown in Figure 2. The Growth Study population consists of the students in these high schools and in all the junior high schools and elementary schools feeding them. The initial sample consisted of approximately 9,000 fifth graders, 9,000 seventh graders, 9,000 ninth graders, and 5,000 eleventh graders, giving a total of 32,000 subjects.

By 1963, when all subjects were tested for the second time, 93% of the original subjects remained, but since the Growth Study makes a practice of testing all the students in the relevant grades of the school, whether or not they had participated in previous administrations, the total sample had grown to slightly less than 40,000. In each subsequent testing the total sample increased by 25% while the "core" sample with complete data decreased by 15%. Presently, there are 45,901 in the total sample and 15,124 in the core sample. When a student leaves a "Growth Study" school no effort is made to follow him to his new location.

Selection. The schools were selected to provide a range in geographic location, size of system, and proportion of senior class graduates who subsequently attended college. Although all the high schools are comprehensive, the proportion of students enrolled in vocational education curricula varies markedly from one school to another. The average enrollment in such programs is approximately 40%.

The opportunities we have had to compare the Growth Study sample with randomly selected nationwide samples indicate that the Growth Study sample quite closely approximates a randomly selected sample. In Figure 3 the Growth Study is compared to the sample obtained in the Survey on Equality of Educational Opportunity, the so-called Coleman Study, the sampling for which was carefully done. The similarity of the two frequency distributions is quite striking. The suggestion is that the Growth Study is slightly

Figure 1. Testing Plan for the Study of Academic Prediction and Growth

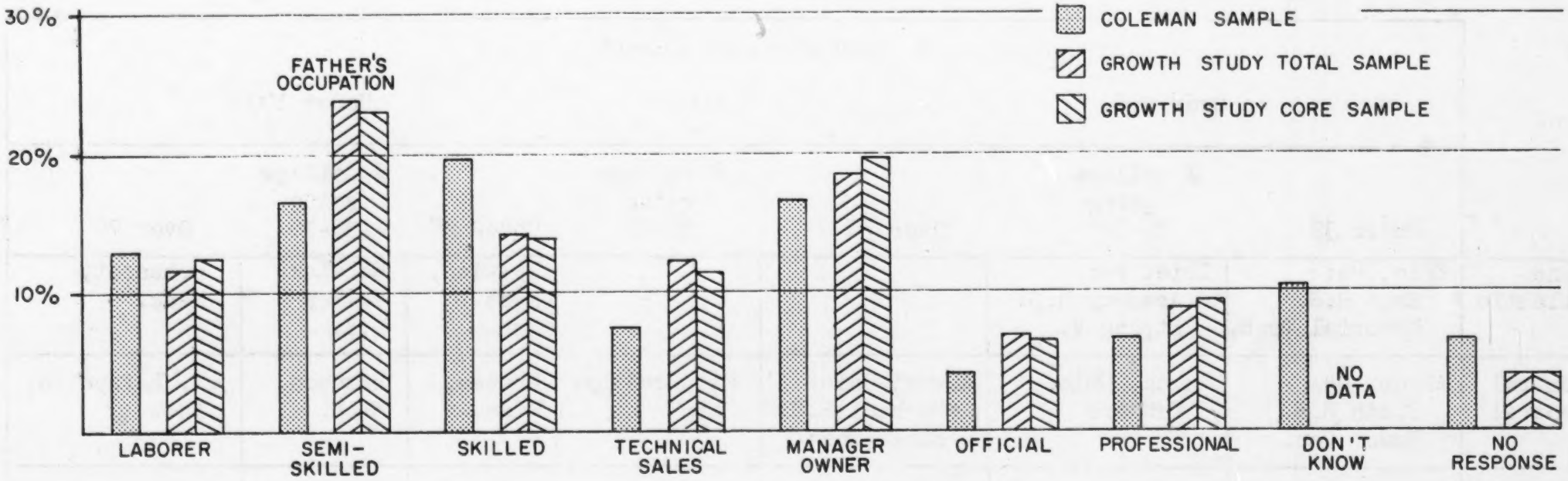
Grade	Sept.-Oct. 1961	Jan.-Feb. 1963	Sept.-Oct. 1963	Jan.-Feb. 1965	Sept.-Oct. 1965	Jan.-Feb. 1967	Sept.-Oct. 1967	Jan.-Feb 1969
5	TGI-L SCAT-5B STEP-4B N=8939							
7	TGI-L SCAT-4B STEP-3B N=8891		TGI-M BEQ-7 SCAT-4B STEP-3B N=8361					
9	TGI-M SCAT-3B STEP-3B N=9245		TGI-H BEQ-9 SCAT-3B STEP-3A N=8724		TGI-H BEQ-9 SCAT-3B STEP-3A N=7671			
11	TGI-H SCAT-2B STEP-2B N=5294		TGI-H BEQ-11 SCAT-2B STEP-2B N=7790		TGI-H BEQ-11 SCAT-2B STEP-2B N=7383		TGI-H BEQ-11 SCAT-2B STEP-2B N=6304	
12		Sr. Quest. BEQ-12 Am. Hist. Eng. Comp. PSAT N=4854		Sr. Quest. Am. Hist. Eng. Comp. PSAT N=6750		Sr. Quest. Am. Hist. Eng. Comp. PSAT N=5891		Sr. Quest. Am. Hist. Eng. Comp. PSAT N=5674
Total Ss per Administration	32,369	4,854	24,875	6,750	15,054	5,891	6,304	5,674

Note: The numbers of Ss indicated for the years 1965 to 1969 are estimates. These totals combine public and independent school counts.

Region of U.S.	12th grade enrollment						
	Over 200			100-200			Under 100
	Under 35	% college going 35-70	Over 70	% college going 35-70	Under 35	% college going 35-70	Over 70
New England Middle Atlantic	Erie, Pa: East H.S. Memorial Tech.	Erie, Pa: Academy H.S. Strong V.	-	-	Ipswich, Mass.	Warwick Valley N.Y.	Cohasset, Mass.
E. No. Central W. No. Central	Akron, Ohio: South H.S. Hower Voc.	Akron, Ohio: Kenmore	Akron, Ohio: Buchtel H.S. Firestone	Mt. Healthy, Ohio	Frazee, Minn.	Bronson, Mich.	W. Lafayette, Ind.
W. So. Central So. Atlantic E. So. Central	Atlanta, Ga: W.F. George	-	Atlanta: Dykes	Yazoo City Miss.	Havre de Grace, Md.	Lampasas Texas	-
Mountain Pacific	Oakland, Cal.: Castlemont	-	Oakland, Cal.: Oakland H.S. Skyline H.S.	La Junta, Colorado	Elma, Wash.	Burton, Wash.	-
No. of Schools	6	3	5	3	4	4	2

This chart presents the classification as it stands in 1969. One school system dropped out in 1962 (Lynnfield, Mass.: 100-200, 35-70%); and a second school in 1963 (Canyon, Texas, <100, >70%); a new school was established in Akron in 1963 (Firestone: >70%).

Figure 2. High Schools in Study of Academic Prediction and Growth.



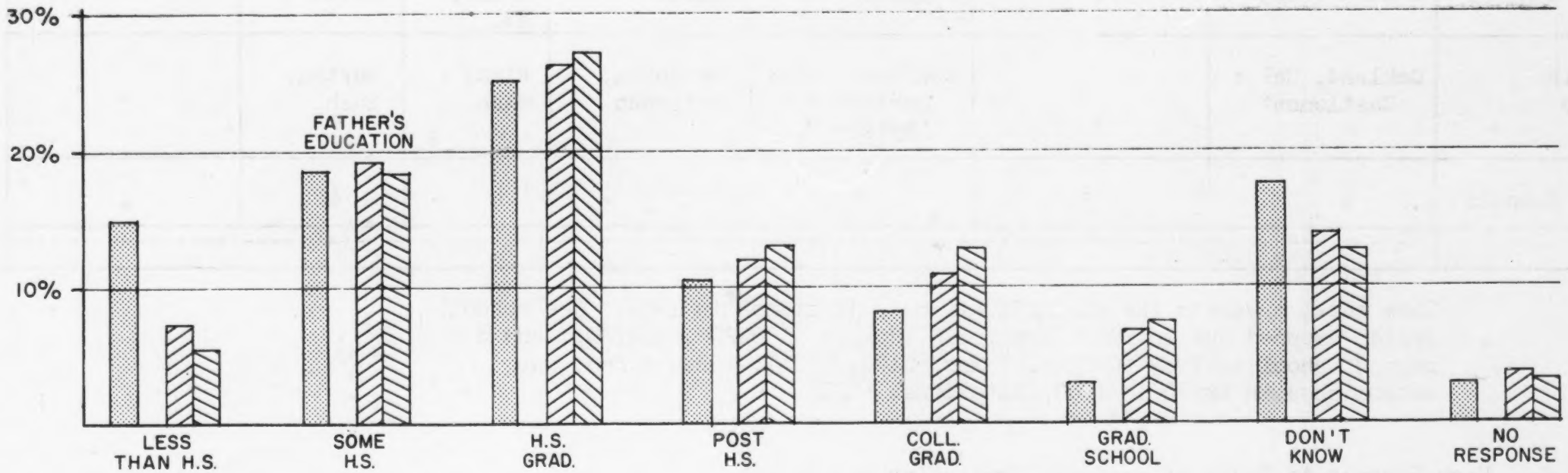


Figure 3 Comparison of Coleman Sample, and Two Growth Samples of U.S. Ninth Graders

under-represented at the low end of the SES scales and slightly over-represented at the high end. It appears, nevertheless, that the Growth Study sample can be regarded as approximately representative of American schools.

Data and Instrumentation. The original and continuing focus of the Growth Study was on academic growth, as measured by objective tests of ability and achievement, with the recognition that this domain is but one aspect of the total development of the student. Supplementary biographical information--on interests, both academic and non-academic, and on educational and vocational plans--was obtained from questionnaires, but the primary objective remained that of thoroughly describing and explaining the student's acquisition of knowledge, understanding and intellectual skills.

The data which were available are listed in Table 1.

Each Growth Study test administration consisted of approximately 15 hours of testing which was conducted in the school by teachers and counselors who were provided with detailed manuals of instruction. The very small fraction of unusable answer sheets received suggests that the test administrators were unusually successful in conducting orderly test sessions. The schools were provided with full reports on the SCAT and STEP scores of each student, and most of the schools used these scores for guidance purposes.

The basic instruments of the study were the School and College Ability Tests (SCAT) and the Sequential Tests of Educational Progress (STEP). The SCAT, which yields verbal and quantitative scores, measures general ability to do school work. The STEP series of achievement tests measure the student's ability to apply his skills to the solution of problems in six areas: reading, writing, listening, social studies, science, and mathematics. Lower level SCAT and STEP forms are scored on the same continuous scale as higher level forms.

Scores on three tests of the College Entrance Examination Board--the Preliminary Scholastic Aptitude Test (PSAT) and two Achievement Tests (English Composition and American History)--provided data on the student's senior-year aptitude and achievement.

The Test of General Information (TGI) was designed especially for the Growth Study in order to identify non-academic factors that are related to students' growth during this period. It was used to determine when and at what rate students learn the kinds of facts that are not systematically taught in school, but which an alert and reasonably well-informed adult could be expected to know. There are three forms of this test at three different levels of difficulty with questions in each of eight areas: home arts, industrial arts, physical sciences, art and music, biological sciences, history and literature, entertainment and recreation, and public affairs.

Questionnaire. The Background and Experience Questionnaire (BEQ) was also designed especially for the Growth Study. It provides

Table 1

Summary of Data Available

Level	Variables	Instruments[1]
Grade 5	Aptitude and achievement	SCAT, STEP, TGI
	School characteristics and community SES	Principals Q.
Grade 7	Aptitude and achievement	SCAT, STEP, TGI
	School characteristics and community SES	Principals Q.
	Academic program enrolled in (If in a junior high school)	Test answer sheet
	Experience, aspirations, interests, & family background	BEQ 1
Grade 9	Aptitude and achievement	SCAT, STEP, TGI
	School characteristics and community SES	Principals Q. & school visits
	Academic program enrolled in	Test answer sheet
	Experiences, aspirations, interests, & family background	BEQ 2
Grade 11	Aptitude and achievement	SCAT, STEP, TGI
	School characteristics and community SES	Principals Q.
	Academic program enrolled in	Test answer sheet
	Experiences, aspirations, interests, & family background	BEQ 3
Grade 12	Aptitude and achievement	PSAT, CEEB tests
	Complete high school record	Transcripts
	Vocational plans	Q. on answer sheet Biography in yearbooks
Summer after high school graduation	Rank in class	Roster to school
Fall after graduation	Post-graduate occupation (Education or vocation)	Questionnaire to school (1st follow up)
2nd year after graduation	Occupation	Questionnaire to individual (2nd follow up)

[1]All abbreviations are explained in the glossary in the appendix.

information on the relationships between the student's growth and his experiences and activities in and out of school. This questionnaire attempts to minimize generalization and vagueness by requiring the student to document many of his responses with facts, such as the titles of some books he has read, the plays he has seen or participated in, the instrument he plays in the school band, or a description of the job he has held during the summer. The questionnaire also yields information on the student's opinion of the courses he has taken, and asks the student to indicate how often and with whom he has discussed topics such as his future education and career plans, news events of the day, or personal values. The same instrument also provides data on the education and occupations of the student's parents and the amount of encouragement and support they give him. Forms of the Background and Experience Questionnaire were developed for the seventh, ninth, and eleventh grades.

Literature Search and Interviews. The first step of the investigation, following the necessary staffing and planning, was to expand the search of the literature and theoretical analysis begun in the summer of 1965 in preparation for the present research.

During the same time period, a number of the 17 school systems participating in the Growth Study were visited with two purposes: (1) to survey the status of vocational education at each school and (2) to interview at each school a small randomly selected sample of students in regard to the state of their career decision-making. The interviews were recorded, although their content was not analyzed in a formal way. The interviews were used (1) to provide the research staff with firsthand acquaintance with the thoughts and feelings of the subjects, (2) to obtain information on the nature and timing of vocational choices in the actual school setting, and (3) to suggest variables and processes which should be incorporated in the theory of vocational development, the development of which stands as a fifth objective of the investigation.

Chapter 3

Strategies for Vocational Research: A Summary of a Discussion[1]

All research grows out of a background of discussion that is seldom recorded. This is unfortunate, for the discussions generally probe a rich universe of possibility out of which the final study must, of necessity, select only a few atoms. This chapter is a condensation of such a probe of a considerable range of pressing issues in vocational development. Specifically, it is a summary, with extensive direct quoting from the transcript, of two days of discussions by the staff and advisors to the Vocational Development Study, January 15 and 16, 1968, at Educational Testing Service, Princeton, New Jersey. In general, explanations of studies that are covered elsewhere in project literature have been cut to only a few words to allow room for expansion on themes of general interest.

This summary is presented here as an introduction to the methodological and substantive issues faced by the research staff in conducting the Vocational Development Study. (These issues also are faced by the whole field of educational research.) The points made in the discussion highly influenced the design of the various studies conducted as part of the Project.

Speaking during the proceedings were the following advisors: William E. Coffman, then Acting Director, Developmental Research, ETS; Bruce Eckland, Sociologist, University of North Carolina; Norman Frederiksen, Director, Division of Psychological Studies, ETS; Edward Landy, Assistant Superintendent and Director of Counseling Services, Newton, Massachusetts Public Schools; Roger Myers, Associate Professor of Psychology and Education, Teachers College of Columbia University; W. Benton Schrader, Senior Research Psychologist, Test Program and Statistics, ETS; and Benjamim Shimberg, Director, Vocational-Technical Education Projects, ETS. Staff members speaking (in order of their appearance) were: Thomas L. Hilton, Project Director; Martin Katz, Associate Project Director; Donald Rock, Lila Norris, Michael Patton, Norman Freeberg, Michael Rosenfeld, Franklin Evans, Patricia Casserly, and William Godwin.

Among the matters explored in this summary are: intervention effects on research design, p. 3; prediction and student decision-making, p. 4; a critique of prediction models, p. 5; the issues of status and separation, p. 6; freedom of choice and prediction models, p. 7; decision versus drift, p. 8; freedom of choice and education in a democracy, p. 9; a vocational choice model, p. 11; the need for case studies, p. 13; the problem of washing out differences, p. 13; teacher and curricular effects, p. 14; predicting what might have been, p. 15; multiple regression versus moderated prediction, p. 16; follow-up studies, p. 17; the problem of criteria, p. 19; the pursuit of dropouts, p. 20; the relevance of settings: the school, the community, and the nation, p. 22; efforts to develop a vocational choice model, p. 27; the computer in vocational development, p. 29; and a closing exercise in path analysis, p. 33.

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[1]This chapter is largely the work of David E. Loye who recorded and extensively edited the discussion on which it is based.

Intervention Effects on Research Design

In getting the discussion under way, the problem of intervention effects was raised by Landy. The Vocational Development Study, he noted, "depends upon getting data about youngsters as they pass through existing schools and existing experiences. Is there a danger here of crystallizing the status quo? Also, how does one allow for the possibility of intervention to effect change?" What if, in some school furnishing Growth Study data, a Martin Deutsch, a Jonathan Kozol or a Herbert Kohl were at work exciting slum children about learning so that their futures might be radically changed from the normal expectation (Deutsch, 1967; Kohl, 1967; Kozol, 1967)? How would this affect the prediction model the project seeks to develop?

Possibly one attack would be to "look closely at a number of schools, identify differences in output, and go back and see what lay behind it," Coffman suggested, noting that besides classroom and single school effects, a gifted administrator might be implementing changes affecting a whole system. He also felt that much that is effective results from "exposing children to a lot of different teachers and different settings and sometimes something clicks. I doubt if a single model will be appropriate. More likely we'll need a complex set of models depending on some subclassification of individuals."

Eckland felt the matter of intervention was mainly a problem of controls in the research designs and being wary in drawing conclusions. The Growth Study purpose, Hilton then suggested, should put the matter in perspective. "To our knowledge there's never been a study involving a nation-wide sample that has taken a group of students early in their careers and followed them for nine years, as we will have by the time we're finished. Our general point of view has been that there is a need for base line data about student development. To a large extent we <u>are</u> documenting the status quo. But as to the danger of our crystallizing the status quo, I would argue that we're trying to provide a base line from which departures from the status quo may be detected--a base line we can identify in the schools, so that the effect of interesting departures may be studied empirically."

It was also noted by Landy and Myers that when one considered the present state of affairs in American education, the probability of interventions affecting the data was, unfortunately, quite slim. Herbert Kohl, Myers noted, had quit in disgust after a year of exciting work in slum schools and had subsequently observed that "the kids went back to their same old way of doing things."

Prediction and Student Decision-Making

To clearly see the problem of constructing prediction models, one must return to the beginning of the school process, Katz offered. "It is helpful to think in terms of stages of vocational development--to search for events at one time that are relevant to vocational development at some later time." It seemed to Katz that it might be good to discover

a school devoting attention in the early grades to student decision-making--"that is, to giving the students the notion that they are competent people who can make choices, can act on those choices, can get feedback from those choices, can evaluate the results of their choices, and can use this information in later choices." He told of an experience working with Philadelphia schools on planning a career development project that could give pupils structured experiences in individual decision-making as early as the first grade and on into high school. "These experiences can help develop a sense of agency and decision-making skills. At an appropriate stage information about the world of work and about educational options would enter. Students who had been through this sort of experience would be expected to emerge with a greater capacity for making informed and rational decisions than students who had not been through this experience."

Critique of Prediction Models

Eckland asked what was meant by "prediction model." He hoped it didn't mean merely "the situation where a host of demographic or behavioral items are thrown into a battery, and sophisticated statistical methods are used to see which items may hang together, but without any idea in a longitudinal or developmental sense of what the causal nexus might be. It seems to me that unless we take an approach that deals with causality--with causal inferences and with models that deal with causal inferences--one doesn't get very far in this business."

An even more fundamental danger, Shimberg felt, was the use of the prediction model as a self-fulfilling prophecy. "We describe what's likely to happen, and usually it happens that way because we make it happen or we let it happen. In the best of all possible worlds, the tester would say: This youngster is very poor in numerical skills, he's going to have trouble in mathematics unless we do something about it. So let's do something. Instead, we say: He's going to have trouble in math, and sure enough, he goes ahead and has trouble in math. Then we say, Look, how bright we are. We predicted this youngster was going to have trouble in math and he did."

Eckland felt causal inference models might remedy this situation, and that Growth Study data, being longitudinal, were of the greatest importance to those interested in developing causal inference models. "The primary stumbling block with causal models is the problem of sorting out the time dimension in which the action takes place. Getting the precise temporal ordering of the variables is mandatory in order to study their interaction. You can only do this through repeated observations, and this is what is so appealing about the Growth Study data. It does have repeated measurements by which you can, with a fair degree of confidence, put the variables you're dealing with into a meaningful sequence." Rock explained that this avenue would, in fact, be explored through path analysis of Growth Study data, as part of the study. The basic question being asked was: if this student or that student was in a different treatment, or program, what different outcomes might result?

The Issues of Status and Separation

Another basic issue that should be discussed, Eckland felt, was the status problem of vocational education--"how it is seen by others within the value system of a high school, and within the community, and the problems that this status problem presents for vocational education in competition usually with an academic program." There were, for example, some indications that vocational education should be carried on apart from an academic program, especially at the junior college level. When vocational education was integrated within a community college, with free tuition and an open system, the prestige of the more dominant academic orientation for students seemed to undermine the effectiveness of the vocational education program.

Was he suggesting examining whether vocational education is different if conducted in a separate vocational school than in a comprehensive school? Coffman asked. How might this concern relate to the choice process, Landy wondered. His concern, Eckland explained, was not with process <u>per se</u>, but with "whether enough attention is being paid to the structure of opportunities within which the choices are made." Shimberg agreed the opportunities existing in the school situation could be critical. "More and more people are reaching the conclusion that it is not vocational education that is the dumping ground in our educational system, but that it is the general education curriculum. You can see the effects--the general curriculum students cease to progress academically because they can find no purpose in their studies--no real stimulation--as compared to youngsters in vocational programs who are generally more highly motivated and goal directed."

Freedom of Choice and Prediction Models

Discussion then centered on the question of the individual's freedom of choice--"to what extent these choices are structured for him, as against the kind of opportunities he has for changing his condition," as Eckland put it. Or as Katz expanded in paraphrase: "to what extent the individual is given an opportunity to be a strategist in his own decision-making, and to exercise some freedom of choice according to his own perceptions of what is desirable; as opposed to a structure that perhaps insidiously and surreptitiously predetermines what his choice is going to be. And not only predetermines <u>what</u>, but even <u>how</u> his choices will be made."

Strictly from the scientific point of view, Eckland felt it was difficult to speak of free choice. From the point of view of the social scientist, one had to make the highly deterministic assumption that <u>everything</u> could be predicted if one had the right grasp of the situation. "But from the viewpoint of counseling, it's very important, I think, to develop a model in which you are assuming that the individual is capable of some degree of free choice."

Coffman felt this moved the study into central focus: "to find out how much we can understand by asking how much we can predict. The ultimate goal of this and a succession of other studies over the next

thousand years is perfect prediction. But mainly for the purpose of understanding, and only secondarily for the purpose of managing. This is the danger of the prediction model--the danger of the word itself. The danger is that at some point along the line you forget that when you planned it you were really seeking understanding--that you don't have, in the model, something sacrosanct and foolproof."

Decision Versus Drift

An allied concern, Eckland felt, was the danger of assuming that lives were determined by a rational decision-making process based on the individual's response to a clear-cut "crisis"--"the kind of situation where one is presented with a number of alternatives and a decision has to be made on December 21st. Life isn't like that, for the most part. Life to a very large extent is a process of drift. One drifts into situations where the decisions to a large extent are unconscious and the result of small incremental changes."

Taking issue with Eckland's attack on the rationality of individual decision-making, Mrs. Norris outlined an experimental methodology developed by Gerry Halpern and herself that might be used to investigate the question (Halpern & Norris, 1968). "If you provide them with the probabilities of attainments in the various curricula, and the type of information they need to formulate strategy, and then have them make a choice, you could see just how rational the decision is. How <u>are</u> they weighting the various elements that go into making the decision? What sort of strategy <u>are</u> they following?"

Eckland agreed the approach could be valuable, but explained his concern was that "sufficient attention be given to determining the structural variables that limit the alternatives for the individual." If this was the case, Patton wondered, why go in with the <u>a priori</u> kind of explanatory model Eckland felt was needed: "Don't you think we should be more inductive?" There were certain kinds of assumptions one had to make even in using the inductive approach, Eckland noted. "These assumptions determine, for example, the kind of variables that you will select from the environment to look at. There has to be some combination of both deductive and inductive approaches."

Freedom of Choice and Education in a Democracy

Katz then took issue with Eckland on the questions of freedom of choice, decision by the individual, and whether there were notable decision points as opposed to a process of drift. "I would suggest that one of the most distinctive features of our culture is its emphasis on choice. Moreover, not only do we tend to find opportunities for choice as individuals, but as a society we impose requirements for choice, and this is very strongly tied to the whole notion of individual freedom and other universals in the American ideology. So great is this ideological requirement that we even artificially establish requirements for choice when none might be needed. For instance, in school there are choices that are not really necessary, that don't have to be made at a given point, and

yet we encourage students to face alternatives and options and choose between them because we're convinced that there is some developmental importance in learning to choose. This is somehow wrapped up with the whole notion of a democratic society that elects its officials--choice again; and so we believe that people need training and education and developmental experience in choosing. And we almost deliberately introduce what Tiedeman and O'Hara (1963) call 'discontinuity periods,' in which you are aware of a certain state in which you presently exist, and you are aware of a new state of affairs with some options inherent in it, and then somehow you must decide which of these options is most desirable from various points of view, and you must then move from where you are to where you want to be under the new set of circumstances." The whole guidance movement, Katz felt, was based on this assumption.

Freeberg took Eckland's position, questioning whether this really occurred. Landy felt the truth lay somewhere in between, and that the issue was to what extent students were being made aware of the fact that they were making choices and could bring to bear rational processes on these choices, or to what extent the choice was forced upon them--"and to what extent they drift into a choice, in Bruce's terms. To what extent is the structure of the institution in which the youngster operates obvious? For example, a student in a small high school that has no vocational curriculum at all, just by the nature of the structure of the institution, cannot make the choice for vocational education. I think what you're stating, Katz, is a position we should aim for and try to create. It exists to some extent here and there, but how universal it is, I don't know."

"Would you agree that there is a kind of universal ideal of rational decision-making, even though this ideal is often violated in practice?" Katz asked.

"It is given more lip service than real service," Landy ventured. "For example, it may be nothing so obvious as the counselor telling the youngster exactly what to do, or the principal saying you must go here rather than there. The counselor says to the youngster, 'Here are some choices, it's up to you.' But, in fact, the choice is determined by the youngster's own set of values, the effect of the institution, the family values, the values of his peer group--all these things bear on him. We have a vocational high school in our town--or we did until we incorporated it and made it part of the comprehensive high school--to which many of our counselors felt some students ought to go. But the youngsters chose not to go there. They wanted the general curriculum because it was demeaning in status to go to the vocational school in our community, which is largely a college bound community. You have this kind of problem, and even when you attempt to reason with the youngster, other things still are so powerful they prevent reasoning from taking place. Until and unless right from grade one on we can somehow inculcate in youngsters the necessity for examining choices in a rational way, we will still have not necessarily irrational but nonrational decisions at points of discontinuity."

A Vocational Choice Model

Mrs. Norris summarized a study by Gerald Halpern and herself of the way students acquire and use information in making a vocational choice (Halpern & Norris, 1968). This prompted these thoughts by Katz about possible mathematical weightings and relationships for a vocational choice model. "I think that we should be concerned with the situation as a student perceives it--that is, he can make choices and these choices are related in some way to what he wants, his desires, his values, specific things he wants to attain. I've been working on a model that attempts to capitalize on this notion using three systems, a value system, an information system and a prediction system. We have him explore and scale his values by a very simple process. Then we look at the options--to what extent will each option give him the satisfactions he seeks in respect to each value? We then multiply instrumentality times strength of value to obtain a product and add up these products for each option. Then we can look at the prediction system and ask: What are his chances of attaining this option? Conceivably we can come out with a decimal that represents his chances. Multiplying this by the sum of the products for each option will give us some index of the combined subjective utility and objective probability of each option for this individual. And this should enable him to rank order the options in a very rational way--assuming that rationality is possible in dealing with choices."

By recycling through this process, Katz explained, the student could try out several possibilities. This model of the vocational choice process emphasizes this essential difference from the usual approach: rather than simply presenting the student with an array of options, as in most counseling, his values are first identified, and then the options related to the values. "One thing we'd like to examine closely would be individual differences. Do some individuals make use of a rich and detailed array of values, while others draw on a rather sparse and penurious array? And is the content of this array related to background data? Is it predictable? This again gets us into the question of the degree to which choice involves free will or determinism. Can we predict what his values will be from elements in the background data? I suspect we might get a few rather modest predictive items, but I wouldn't expect to get any great strength of prediction."

The Need for Case Studies

Landy felt these thoughts suggested the need for case studies of individuals within the research design. He noted Piaget and Skinner as examples of important theorists who based their work on small samples. Individual case studies, he felt, could give clues for larger investigations. Myers also noted the need to use such "real life" referents as a source of subjects for testing theoretical models to prevent the proliferating simplification which can afflict models that are not repeatedly checked against reality. "A half dozen very intensive case studies, including studies of family background, interviews with parents and so forth, to get as thorough a picture of a few individuals as you possibly can" would be a good idea for the next stage of the study, Landy felt.

The Problem of Washing Out Differences

A study by Patton and Morse (1967) of differences in Growth Study students' aptitude and achievement from the fifth through eleventh grades was summarized by Patton.

In the discussion of follow-up study plans, Schrader questioned whether the multivariate analysis design proposed was preferable to a single-dimensional approach using SCAT or STEP scores as a dependent variable and comparing early and later regression lines. "I think the idea of putting this whole thing through a big wringer to see what comes out doesn't fit with what Bruce [Eckland] was saying." Eckland agreed, questioning whether curriculum and school differences might not wash out one another. Shimberg was also concerned about the possibility of losing important differences. He felt that whether or not one could predict a student's progress might be a measure of whether the school was any good. "In schools where behavior subsequent to the fifth grade was clearly predictable, you could entertain the hypothesis the school wasn't really doing very much for the kids. And where you couldn't predict, this might indicate that a successful intervention had taken place. If you pool your data, you'd know that you do or don't have a good prediction model, without knowing what's happening in the individual schools."

Patton agreed it was a concern needing to be cared for in the design. A problem, however, was that "at present the only measure approximating a measure of school quality is the SES level of the students attending the school." Hilton and Patton then explained the multivariate method that would probably be used would seek first to find significant main effects for schools, then examine other variables (curriculum, sex, SES) based on whether or not significant school effects had been found.

Teacher and Curricular Effects

"To what extent will you be able to tackle the question that differences are the result of self-fulfilling prophecies?" Landy queried. Early in the sequence you labeled some youngsters academic and some non-academic, he noted, and later those labeled academic did better on academic tests. "The teachers think they're better. They have higher standards for these youngsters, and they teach them more rigorously and vigorously."

This effect of teacher expectation had been compellingly documented by Robert Rosenthal (1966), Patton noted. The impact of the two different curricula also seemed an important influence accounting for the gap, Landy felt. Still another possible influence, Shimberg noted, was sectioning for homogeneous groupings, "where the poorer kids get put in the lower section and get essentially a more impoverished treatment, a sort of maintenance rather than a demanding treatment. This could account for the spread."

Regarding these differences, Patton noted that within the Growth Study sample there were great differences in the average performance of vocational students in different schools. Landy felt this was not uncommon in schools, one cause being the uncommon or specially motivated teacher.

"You get a department head, say in mathematics, who is very anxious about the reputation his kids create for him on College Board scores. He becomes finicky in admitting youngsters to his eleventh and twelfth grade mathematics programs." And Shimberg noted an instance in one high school, where "the people in the business education department are very fussy about which girls they'll let into the business education program. Some of the kids who need it most, the average, even below-average students who could make good clerks or typists, are not permitted in because of the image problem."

For these and many other reasons, Hilton noted, an outcome of Phase I of the study was the conviction that considerably more had to be known about the individual schools, and this was to be primarily Mrs. Casserly's concern.

Predicting What Might Have Been

A method of evaluating whether or not a student was in the best possible program for his particular unique set of capabilities--and whether or not such a program was presently available to him--was explained by Rock.

One hope, Rock explained, was that the approach might solve a seemingly unsolvable classification problem. "If you want to know if a fellow's going to become a good machinist and he's a psychologist, you have to let him be a machinist for a while to really find out. Of course we can't do that. But this is an approximate solution to this problem."

The method, essentially, would compare matrices of background and behavioral variables with matrices of predictor and criterion variables, working in actual practice somewhat like this. "Let's say we have a compulsivity factor from the biographical information. This is a hard-working individual, he studies every night and does all the things he's supposed to do. If we look at his background we may find that he's middle-class SES, and other factors may indicate he's a success character. We don't worry too much about him. But then we have a fellow over here who is low in compulsivity, low in SES, and his profile on other background variables may be quite different from the success character. Well, maybe we'll find a success group in some other curriculum that has a profile very much like his. Then we might be able to say that this person, if he had started in this curriculum, might have done better than he did."

Multiple Regression Versus Moderated Prediction

The method, Rock felt, might also answer the question of how early one might predict a student's choice of program or vocation--not necessarily success in that choice, but the choice itself. This might be as early as fifth grade. Then he criticized both the use of multiple-regression analyses and the idea of hypothesis-testing versus plunging into the data to see what correlates. Of conventional multiple regression analyses: "they should have stopped it 10 years ago." He preferred "a

moderated prediction model, where I can group people multidimensionally on background variables. . . . There are other ways of forming taxonomies than the analysis of variance of known groups. Group people in multidimensional space, then do your statistical analysis. Instead of starting with known groups of, for example, boys or girls, I think more work should be done in finding people similar on a lot of dimensions instead of one or maybe two at a time. Let your computer do your taxonomy for you. That's what it's for." Of hypothesis-testing: "I think this business of using the computer to search for things works better than hypothesizing beforehand. You just have too many variables to contend with in hypothesizing. You can use the computer to cut them down to size."

Discussion centered on how the approach might be related to the problem of differences among schools. Landy felt it would be interesting to see whether students with the same set of background characteristics as measured by the BEQ would turn out differently in different schools. "The Coleman Report (Coleman, et al., 1966) suggests they don't," he noted, and remarked that this led to such interpretations as the one that it made no difference to put Negro children in better schools unless they were integrated. Hilton felt the question might be answered because race <u>was</u> known for students in several Growth Study schools. As for the BEQ as a predictor, however, Hilton described a study using Growth Study data that cast doubt on the notion that SES level and other background variables had high predictive value for high school students (Hilton & Myers, 1967). This was an encouraging finding, Landy noted, suggesting that the individual <u>could</u> overcome the background, or that interventions <u>did</u> make differences.

<u>Follow-up Studies</u>

The crucial problem of relating what happens to students during school years to their actual vocations in later life was probed in detail following a presentation by Hilton of past (Rothenberg, Klein, & Morse, 1967) and future prospects for follow-up studies.

A tentative decision, Hilton explained, was to concentrate on those in the Growth Study sample who had graduated in June of 1965. They would now have been out of school three years. With the boys, probably one-third would be in military service, one-third in four-year colleges, another portion would have completed two years of a junior college and be employed, and another portion would be in various vocations. Eckland was concerned about whether the follow-up study would be taking "simply the graduates or are you going back and starting with the original ninth grade sample? Obviously you're going to miss a lot of people if you take the high school seniors only, because there's going to be a lot of attrition between the ninth and the eleventh grades, with people entering the labor market or perhaps going into some kind of vocational technical programs outside of the high school."

This was a serious problem that must be remedied, Hilton agreed, as they did lose 15 percent of the sample between the ninth and eleventh grade groups. Continuing his critique, Eckland felt three years after high school was an awkward time for follow-up studies--it was right in

the middle of the time people were making decisions; for example, women, about marriage. He felt that a series of follow-ups over 10 years would be better. Schrader agreed, but noted the best time for the first follow-up was soon after graduation, as the high schools could furnish very good data on recent graduates, whereas after two years "everything gets very cold."

Shimberg then noted that this general problem area was so important, and yet so difficult, that he felt the best one could hope for "between now and August" was a few exploratory studies, and then go on to the "big follow-up" later. "One of the really hot issues in the field of vocational education is this need for a dependable, reliable method of following up the graduates of occupational programs to know where they land, and how long they stay, and how satisfactory they are to their employers. I think the same thing is true of people who graduate in academic programs. The counselors know that certain students went to certain colleges, but they seldom know their survival rate."

The Problem of Criteria

Freeberg was hopeful suitable criteria would emerge from the follow-up studies--some measure of "vocational maturity," for example. What did the term mean, Eckland wanted to know. He noted that a Carnegie funded study asking this question had produced a great list of objectives but no single clear answer. Rosenfeld suggested "vocational satisfaction" might be a better term. Shimberg suggested that vocational maturity was a matter of style of decision-making. Myers noted that another study had shown that whatever vocational maturity was, it wasn't the same for ninth and for twelfth grade boys.

The chances of the project resolving the meaning of "vocational maturity" were slim, Hilton noted; however, the discussion did suggest the practicality of not being too ambitious at this point in the follow-up studies. He felt it would be wise to follow Shimberg's suggestion and limit the effort to a few exploratory studies, possibly even confining the probe to the excellent data the Oakland public schools already had on 1965 graduates. To this one might add locating and questioning Growth Study schools' 1967 graduates. One might also compare the occupations seniors aspired to last June with their actual present occupations for some measure of realism of aspiration.

Landy questioned this idea as not taking "the changing society in which kids go" into account. "It's conceivable a choice may be realistic in the twelfth grade and not one year later because of purely extraneous factors--a dip in employment, or peace is declared and an airplane factory closes down, and so on."

The Pursuit of Dropouts

Trying to find a good way to study dropouts using Growth Study data was a frustrating problem, Evans reported.

He had discarded the idea of following a Growth Study dropout subsample as being too expensive, and the idea of a study of dropout antecedents as having already been done extensively by others. This left him with the idea of comparing intellectual growth patterns for dropouts with those for continuing students, but then he had run into the problem of the child tested in the fifth grade who falls behind a grade and is not tested again in the seventh or the ninth grades--in effect, dropping out of the sample.

"You have no faith in our educational system," Shimberg noted. "We practice automatic promotion."

Not according to the literature, Evans suggested. At least it "seems to show that people who drop out of school tend to fail during the first two grades or somewhere around the seventh grade." Even so, Landy said, there was much automatic promotion, warranting use of the data. Evans then explained how he planned a study of dropouts using Erie public school data. He would find the dropouts by progressively narrowing the search among those tested in the fifth grade who do not reappear in the eleventh grade testing. Why Erie? Shimberg asked. Why not Oakland? Because Erie offered a special advantage: Akron schools had SES similarities to Erie that made possible some interesting comparisons. "If we can build a prediction model in Erie, will it apply to Akron? Can we take an equation based on the Erie public schools and apply it to the Akron public schools and get the same kind of prediction? Will it hold up in this kind of cross-validation? If not, is the school intervening? And how do schools differ? How do the communities differ? This may not all be done in this phase of the study, but it's something that certainly should be carried on."

A stable characteristic one might find with the eventual dropout would be no gains in achievement testing through grades five, seven, and nine, Shimberg suggested. "In other words, they're not learning anything." Evans identified this as a hypothesis he was using. Another was that the dropouts were not "getting any encouragement, no positive feedback, and so they're dropping out." He also noted that a Department of Labor study showed that something like 84 percent of the dropouts were retarded by one grade, and that roughly two-thirds of this figure were retarded two grades.

However one gathered the data, it seemed extremely important to Eckland to get information on those who had dropped from the sample, "not only from the standpoint of studying the group itself, but also for the implications these data may have for the findings on those who remain in the system." He noted that one finding over a period of time was a greater standard deviation as one moved from the fifth through the twelfth grade. "One begins to wonder how much that greater dispersion may result from the impact of the dropout of certain individuals from the system. Students who scored in the next to the lowest percentiles in the fifth grade and remained in school through the twelfth grade may now be scoring in the lowest percentile because those previously at the very bottom dropped out of the system. Suddenly the dropouts are gone and the youngsters close to the bottom now see themselves actually at the bottom--and so, too, do their teachers."

Hilton noted this as a concern for the study. "It seems to me a very interesting hypothesis that a student's perception of his relative position in the class, and his relative growth, is the critical factor, and not his perception of his absolute achievements."

Of Settings: the School, the Community, and the Nation

Mrs. Casserly presented some preliminary plans for probing the matter of setting or climate with interviews. Her purpose would be to identify factors in the school or the community that might account for "the results we are getting, not only in the test scores, but also in the feelings of the students about entering various programs, and their expectation of success in them."

One of the main things she hoped to find was how much self-selection was involved. "We're back to Marty Katz and the free will question--how much self-selection there is, or how much selection is determined by the counselors or teachers or by influences from outside school, from the home and the community."

A number of suggestions for adding to her proposed questions for interviews were offered. Landy felt it was important to look for evidence of unusual, innovative programs, in instruction or guidance. "For example, we vacated a small elementary school building, the high school was overcrowded, and we asked some youngsters and some teachers if they wanted to volunteer to go to this separate building and, in a sense, be as 'way out' as they wanted to be. And indeed they have--about 125 youngsters and their faculty work together in setting their own rules, and they deliberately avoid having any kind of administrator. Whether it'll be complete chaos at the end of the year as it started out, I don't know, but it gives us a chance to try something new." Landy also felt the schools should be queried as to what use they were making of ETS tests, such as SCAT and STEP, for counseling purposes.

Katz suggested evidence of vocational orientation programs as something to look for. Rosenfeld suggested the school's role in placement was important. Patton felt atmosphere should be noted, mentioning that he and Evans had visited a school that gave one a definite feeling of "we are ladies and gentlemen and we act like it all day long and if we don't we get clobbered." Katz raised the question of using a formal instrument in addition to interviews--something on the order of, for example, the attempt to "adapt Pace and Stern's college characteristics index to high school use." Shimberg felt that perhaps attention should be given to critiques of the Coleman Report, so that this study might avoid some of its pitfalls.

"If we're going to draw inferences on a relationship between school characteristics and achievement, I think it might be worth looking at what Levin and other critics of the Coleman Report say. For example, the school expenditure figures were apparently arrived at simply by taking the total budget for the school system and dividing it by the number of students in the system, and assuming that financial resources were being allocated across schools evenly. It tends to give a distorted

picture for slum schools. There are a number of such methodological points raised here and it seems to me that if the only way to get this data is by being in the school and asking about it, this might be a good time to do it."

Patton hoped that interviews with counselors would elicit recent specific case histories as well as general information. Katz suggested asking each counselor for one case with which he felt he'd been successful, and another with which the counselor felt he's been unsuccessful. Patton noted the latter might prove difficult to obtain because of the sometimes fantastic investment in schools in maintaining a success stance or front.

Eckland then raised the question of how this particular probe was to be seen within the perspective of the crucial relation of vocational education to the organizational structure within which the vocational education was provided--that is, the structural requirements of the community, the nation, and the national purpose.

"We are faced with all kinds of problems in most urban communities, especially problems that relate to de facto segregation, whether of race or of class. We have problems of certain kinds of inequities in the schools that derive from the social organization of the community, and this may really have nothing to do with the school per se, but is reflected in the school as a consequence of these external conditions. We also have a number of opportunities to deal with these problems. Increasingly there is experimentation with different kinds of organizational structures for schools. We're talking about educational parks and so forth, and some of these innovations very likely will come about. So it seems to me that we need to consider what of really crucial importance is involved in these innovations. One of these key issues comes out in Conant's (1959) writing on the American high school--the stance, for example, that he has taken regarding the notion of the comprehensive high school as being a democratized experience, one within which you bring together a great deal of heterogeneity, students from all kinds of cultural backgrounds who hopefully will interact on some basis within the context of the school, and will thereby become better citizens, better future leaders."

"However," Eckland continued, "there is much evidence that suggests that this just doesn't work--that within the context of the school the stratification and the structure of the adult community is carried over pretty much as is into the high school. We find this has developed within the system of tracking, and within separate curricula for vocational and academic programs, and so my feeling is that you should especially seek to grasp the kinds of attitudes that students hold toward students within other curricula. Ideally, one could have some kind of sociometric design and see what the social status structure of the adolescent actually is within the school, and see what kinds of social cleavages and how much social distance there might in fact be between these kids in the various curricula."

Frederiksen ventured that he didn't doubt the value of such a study, but wasn't entirely sure how it might relate to Casserly's interviews, which were perhaps in danger of becoming "all things to all men."

Casserly felt the concern could be fitted within her purpose of relating school setting to community setting. Katz could see it was "tremendously important--that is, the extent of segregation or isolation between those in the vocational curriculum and those in the academic curriculum. This might be a more critical dimension to examine than simply whether a student is in one or the other curriculum. That is, is he in a vocational curriculum in a school where the vocational students are the goats and the others are the sheep, or is he in a school where they go together?" He felt that a technique used by Newcomb for measuring the probability of a student in one curriculum encountering a student in another might be worth investigating. Or within the questionnaire approach, questions determining the intermixing in extracurricular activities such as debating or dramatic clubs would be relevant. Questions of this nature relating to student government and the mix of parents in the PTA were part of her planning, Casserly said.

Katz noted the home room as one such mixing point. For Eckland this was "the only thing I can find in Conant's writing that gives any legitimacy to his argument for a comprehensive high school, the only mechanism within the structure of the school where he indicates this mixing might take place, and none of us really expects this is going to solve the problem of gaining meaningful contacts--contacts in which some meaningful interaction between students takes place." One might also find, however, that in communities that emphasize athletics, the chances for a vocational student to star in schools were bettered, and Katz noted there might well be schools where "the athletic domain is the other students' domain." Rosenfeld suggested teacher interaction might also be worth looking at: "Do the vocational teachers talk to the academic teachers in a comprehensive high school? Again, it could be some indication of the climate of the school and the quality of the various programs."

In his own experience with the vocational vs. the comprehensive high school, Shimberg said he had found that the comprehensive high school as envisaged was "very, very hard to find. People will have a vocational program and an academic program under the same administration but they might as well be in two different parts of town for the amount of interaction there is between the two. Students are block scheduled and all the vocational students take their work together. The faculty is also separate because they don't feel very comfortable with the academic people. You really have different societies. I think Conant was being pretty idealistic in his description of vocational schools. At least, I haven't seen many schools of the type he talks about."

Landy felt the most important closing point was not to be bound by "existing frameworks of thinking, which keep us limited. The effects upon youngsters are often not to be found in what we might commonly posit as hypotheses, but in general climates and relationships and things of this sort."

Toward a Vocational Choice Model

Godwin explained the project on which he and Hilton would concentrate-- the development of a model of the vocational choice process (Godwin & Hilton, 1967).

The study was under way at one of the Growth Study schools. The purpose, he explained, would be to develop for several schools "an explicit diagram of how the counseling system works, a flow diagram with the choice points identified--not only the choice points that the school says exist, but the choice points that seem to exist in actuality." To give a better sense of the purpose and value of a model, Hilton then explained how the project had arisen. Two years ago he and an assistant had spent two days in one school following guidance counselors about, sitting in on their interviews with students, and generally becoming acquainted with the vocational choice process as it appeared to be working through students and counselors in this one school. Then Hilton took a print-out of SCAT scores of the students at the seventh grade level and some limited background information and using certain simple decision rules hypothetically assigned students to academic vs. general vs. vocational curricula.

He then compared his predictions with the actual assignments, and two things loomed rather large. First, "that if a student's parents were of high status, that student in this particular school had a very high probability of ending up in the college preparatory program. And the aptitude scores really didn't seem to make much difference, within certain broad limits." Secondly, "in trying to trace the chain of decisions that were made, it looked as if there were certain very critical points, the most critical point being at the ninth-grade level where it was decided whether the student got assigned to college preparatory algebra or whether he got assigned to general mathematics. And although the counselors asserted that there was flexibility here--that it was not an irrevocable decision--we could not find a single case where that decision was reversed, where a student got back into the college preparatory track if he had, in fact, taken general mathematics instead of algebra."

Even using quite primitive decision rules, Hilton's predictions were 85 percent accurate, so he had felt that a rigorous attempt to define the critical information and the critical decision points might provide a "basis for a useful predictive model. But I don't think that's the most important thing. I still see this effort primarily as giving us a great deal of detailed, precise information about the flow of students through the school from the seventh grade through the twelfth, and about how the process differs from one school to another."

The Computer in Vocational Development

The possibility for using the computer to make the same kind of predictions was noted by Frederiksen, who mentioned Carl Helm's program for verbal score reporting as an example of a seemingly extremely complex task that was actually handled with a fairly simple computer program. Godwin acknowledged the computerizing objective, but noted that model development was the immediate goal.

The computer possibility raised a number of important issues, Landy felt. One was this: "If the main purpose is to distribute youngsters most efficiently, so that you have a more exact matching of

abilities with curriculum requirements, then I'm sure the computer can do it just as effectively as the human counselor, and probably more effectively. But if the purpose of guidance and counseling is to instill the attitudes and the sense of values in youngsters that Marty [Katz] talks about, then fundamentally you're not concerned with the most efficient matching of abilities to curriculum. Your concern is with the development of certain kinds of qualities that require that a youngster make some errors in the choice making process as he moves along, errors from which he may recover and learn from in the adjustment. This will give him capacities to build on that will be of lasting value to him after he leaves school."

Whether or not the project succeeded in developing a useful computer model was secondary, Hilton said, and certainly the difficulties were greater than one might assume. As an example, he told of his experience with a school in California after the New York school visit. Attempting to apply the crude rules devised from the New York school to the school data in California proved impossible. The apparent reason was the vast differences in regional situations, a critical factor possibly being "the presence of the junior college system in California. It changed the need for decision making, and the structure of the decisions that were made, and changed this in a drastic way."

Even though considerable differences were found, it seemed to Schrader that enough similarities would be found upon which to construct a "general description of the process which could then be used to move rapidly to an understanding of what is happening in a particular school, and the whole enterprise of checking, confirming, disconfirming, could be done rather quickly."

Shimberg then offered a comparison between the model likely to be found in most schools, and one toward which he felt that other schools should be moving. "In a situation where the choices are simply the college preparatory, or the general or business program, where there is no real vocational program, I suspect that the model you suggest is really operative, and it would operate whether a counselor intervened or not. But not long ago I visited a comprehensive high school in Miami, Florida--Miami Central--which was one of the few that seem to me to be what a comprehensive high school ought to be. A student in the tenth grade could elect to take an hour a day in one of perhaps as many as 25 different trade or technical courses, purely for exploratory purposes. He might then decide that he wanted to go into a trade program, like commercial art or into a technical curriculum, like drafting, or electronics. One thing I found interesting was that many college preparatory students elected these technology programs, not because they were going into technology, but because they saw this as an opportunity to learn something about electronics, or about computers. And vocational students were not locked into a predetermined college preparatory sequence. They could phase in and out on an exploratory basis. I think that when you've seen a number of these schools in operation, you come away with a feeling of refreshment and great possibilities. And I'm concerned that by limiting yourself to the Growth Study data--which may not include schools like this--you may miss something very vital."

Rosenfled raised the question of getting some measure of the student's perception of control over his environment--"that is, the extent to which he feels he can choose what he wants to do, as opposed to being locked in by others' choices." Eckland noted that in the Coleman study a control-over-environment measure had shown value as a predictor of student achievement. Frederiksen questioned the finding as being concurrent rather than predictively valid. "Those who are getting along well tend to feel they control their environment." This was the point he wanted to make, Eckland said, to illustrate that the student locked into an academic program and perceiving control might, in fact, have no more actual control over his environment than anyone else. Perhaps the matter might best be viewed as a symptom, Schrader suggested. "If a student has repeatedly been subjected to failure and discouragement, then he tends to develop this attitude of inability to control his environment, even though the school gives him every opportunity."

Landy said a study by Hummel (1966) of bright underachievers at Newton High School might be relevant to the control question but that he felt it was a subject in which it was easy to slip into simple but misleading explanations that overlooked the subtleties involved. "For example, these questions of control rest in the personality of the youngsters to a considerable extent. We have some kids growing up in rather permissive families with very little controls, who then ironically rush off to some hippie center complaining that they're controlled too much."

Perhaps this again indicated the need for a small number of "in-depth studies of individuals, in which one would get not just at relationships but at what the data mean to the individual," Katz suggested. "And not only with the youngsters, but with their parents, interviewing them on their child rearing practices, for example." Landy agreed, noting it as an earlier suggestion of his. "If you really want to get at this issue of vocational development in some depth, your large sample studies will provide useful but not sufficient information. The individual studies will provide the cautionary data against which your broad scale data, and your interpretations of large scale behavior, can be checked."

A Closing Exercise in Path Analysis

The conference closed with a brief exposition by Eckland of how path analysis might be used to show the interrelationships of variables over time in the study. "I was suggesting earlier that if you can fairly clearly make assumptions about the temporal ordering of events, which is likely as you are working with longitudinal data, you can plot these events in terms of some kind of causal nexus. And what path analysis does is force you to start drawing some diagrams, and to show the matrices and the direct and indirect ways by which the effects actually are mediated from one point of time to another."

He demonstrated the technique by describing a study linking school characteristics to social mobility of women by Glen Elder, a colleague of Eckland's in the sociology department of the University of North Carolina. The interrelationships of four variables were plotted:

class origin, school performance as measured by tests in the early grades and in high school, educational attainment measured by years of schooling, and social status as measured by the status ascribed to the women by their husband's occupations.

Figure 4 gives the path coefficients between variables, summarizes their relationships in terms of causality (indicated by the directions of the arrows), and illustrates how the method can capture and convey meanings that would otherwise take many pages of verbal report interlaced with statistics.

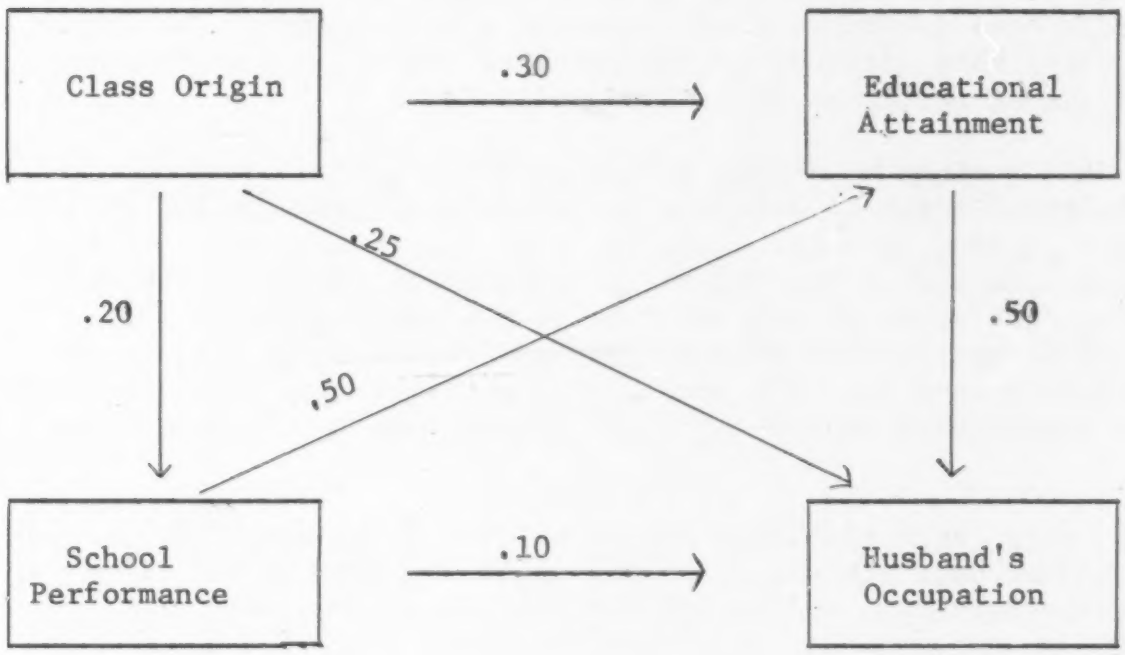

Figure 4. Illustration of Path Analysis

Conclusions

The following conclusions were generally agreed upon, either explicitly or tacitly:

1. There is a need for base line data about the development of U. S. students, but it is important to recognize that the description of status at some point in time is not a description of the way educational development inevitably must be: intervention can change the status of students.

2. Vocational development research must be longitudinal in design and be concerned with probable causes.

3. The opportunities for choice and growth which exist inside the school (e.g., specific curriculum programs) are critical. In general, the effect of school structure on the developmental process is a key issue.

4. Case studies should be included in any program of research as sources of hypotheses and as means of checking theoretical models against reality.

5. Moderated prediction models, whereby subjects are grouped multidimensionally on background variables and then analyzed, may be preferable to pooling groups of subjects into large samples for conventional regression analysis.

6. It is critical to conduct long-term follow-ups of high school graduates to investigate their successes and failures and changing values, attitudes, and occupational needs of the subjects.

7. To understand the full impact of an educational program, school drop-outs must be studied as well as those who remain in school.

In the next chapter the specific studies undertaken will be described.

Chapter 4

Outline of Studies Conducted

From the staff's consideration of various possible approaches to the research problem and also from the two-day discussion described in the previous chapter it was concluded that no single approach would be adequate. Consequently, a multi-method approach was adopted, including case studies, field studies, and several large-scale multivariate analyses.

The total investigation was initiated as a series of closely related but separate smaller studies. In Phase I of the research, which required about nine months, the emphasis was almost entirely on the development of measures and analytical techniques. Six separate studies were completed and fully reported in an interim report. In Phase II of the research, four of the six studies were continued and six new studies were initiated. Thus in Phase II a total of 10 studies were conducted. The write-ups in this final report summarize the Phase I work on the four studies which were continued. Of the two Phase I studies not continued, one has been published externally (Halpern & Norris, 1968) and will be only briefly summarized below. The status of the other Phase I study not continued will be discussed after that.

The Case Development Interview Technique

This technique was developed as a way of investigating the effects of certain variables on vocational planning. A team of researchers under the direction of Gerald Halpern and Lila Norris visited a sample of the 17 Growth Study school systems to obtain information concerning their vocational programs and the way in which a student selected a particular curriculum as an initial step in career planning. Interviews were conducted for small samples of students at selected schools to determine the status of their vocational planning.

A structured interviewing technique was then devised to permit systematic study of the planning process in a way which would be suitable for large samples, and not subject to the vagaries of the clinical interview. In brief, the technique asks the subject (a student) to adopt the role of a high school counselor faced with the task of selecting a curriculum for John, a fictitious student. To help him do this, he is given a table describing the kinds of information available: sealed information cards contain examples of each kind of information. The subject requests the sealed cards, by kind of information, in whatever order he wishes in order to make the required decisions. The investigators reported that not only was ability the area in which students most frequently first sought information, but also that ability remained the most frequently selected information area as a second and third choice, regardless of the first information area selected. Further, "values" was found to be the least frequently sought information area at all stages of the research procedure.

The rejection of information about values suggests a lack of awareness of what Katz (1963b) would consider a pre-potent factor, and indicates a need for education in the role of values and decision-making.

It was concluded that the technique was promising and should be applied to a substantially larger sample of high school students, and that it was important to relate individual differences and decision-making styles to other individual differences and, most important, to the subsequent educational and vocational history of the student. Unfortunately, a change of position on the part of the principal investigator precluded the continuation of this research. The technique is recommended for the investigation of factors involved in vocational planning and decision-making.

Simulation of Curriculum Assignment Process

In Phase I of the Study a pilot study of the process by which students get sorted (or sort themselves) into the various curricula was undertaken by T. L. Hilton and W. F. Godwin. In this study an effort was made to develop a series of decision rules which would simulate the process by which a student becomes identified with a certain high school curriculum. First indications, based on a pilot case study at one Growth Study school, were that at least six groups are involved in this process: teachers, members of the guidance staff, administrative officers, parents, the student himself, and his peers. The sequential decision-making takes place over a period spanning at least six years. The major curriculum assignments--some of which are made by the students themselves and, thus, are "self-assignments"--are made at the ninth grade level, but these appeared to be highly influenced by ability groupings which originate in certain judgments made by sixth grade teachers.

In Phase II it was the intention of the staff to continue this line of research. The primitive decision rules would be refined and translated into computer programs to enable computer simulation of the curriculum assignment process. This work, however, proved to be unexpectedly time-consuming and expensive (especially the computer programming) and, considering that it was not part of the original proposal, a decision was made to give priority to studies which were. A paper describing some preliminary observations about the curriculum assignment process is included in Appendix D.

Phase I Studies Continued

The Follow-up Study

Probably the major effort of Phase II was the conduct of the follow-up study which was begun in pilot form in Phase I. From the inception of the Study it was agreed that following the graduates of the various high school curricula into their post-high-school occupations was a critical aspect of the total study. This follow-up, under the direction of Jonathan R. Warren, is described in Chapter 11.

Factor Stability Study

Of major relevance to the objectives of the Study were the changing interests and values from grade 7 to grade 11 of students enrolled in various curriculum programs. A problem arises, however, when one tries to interpret observed changes: Are they attributable to true changes in the students' interests and values, or are the observed changes attributable to changes in what the scales measured at the different grade levels? The same questionnaire was administered at grade 7, grade 9, and grade 11, but the definite possibility exists that changes in the students' scores resulted from changes in the relationships among the items rather than from changes in their interests and values. To investigate this possibility, a study of the factor stability of the items was undertaken in Phase I of the research by Norman E. Freeberg and Donald A. Rock. Then, on the basis of the experience gained in Phase I, the Factor Stability Study was repeated in Phase II, using a refined technique and a longitudinal data sample as opposed to the cross-sectional sample used in the preliminary Phase I study. The results are reported in Appendix A of this report.

Moderated Stepwise Prediction System Study

As mentioned in the discussion reported in Chapter 3, an important methodological question concerns the grouping of subjects for multivariate analysis. A study of this question was begun in Phase I and was refined and applied to a larger sample in Phase II. Results are reported in Chapter 10.

Patterns of Academic Achievement by Curricular Groups

Tracing the academic growth of the major curriculum groups from grade 5 to grade 11 was a key objective of the Study. This descriptive study, parts of which will be summarized in the next chapter of this report, led to a group of hypotheses which were tested by means of multivariate analysis of variance in Phase II. Chapter 6 by Michael J. Patton describes the results.

New Studies in Phase II

Vocational Decision-Making

The first of a number of studies initiated in Phase II concerned the development of a structured interview to explore vocational decision-making. This study, led by Martin R. Katz, resulted from an examination of available instruments, which pointed to a schedule with questions designed to probe the dynamics of the subjects' decision-making. The development of the schedule is described in Appendix C.

Statistical Methods in Vocational Development

This line of research, by Charles E. Werts, was stimulated in part by the examination of academic growth reported in Chapter 6, which pointed to certain schools and certain curriculum programs which appeared superior to others in terms of the gains achieved by the students enrolled in them. The explanation of the significant differences remained a mystery, however. How do you investigate the complex interaction among all the variables which influence test performance? Conventional correlational approaches offered little promise, but recent developments in path analysis suggested a number of intriguing possibilities. A second motivation of Werts' work came from the Study's concern for vocational development. This problem is also one of investigating complex interactions. Werts' work is described in Appendix B.

Balance of Studies

Three other substudies were described in Chapter 1, in the discussion of the Study's objectives. These were the following:

(1) The School and Community as Factors in Student Achievement. Investigators: Patricia L. Casserly and William E. Coffman. Chapter 7.

(2) Negro-White Differences in Adolescent Educational Growth. Investigators: Michael Rosenfeld and Thomas L. Hilton. Chapter 8.

(3) Antecedents and Patterns of Academic Growth of School Dropouts. Investigators: Franklin R. Evans and Cathleen Patrick. Chapter 9.

Last to be mentioned, but first to be conducted and first to be reported in this volume, was a descriptive study of the curriculum programs of the schools in the Growth Study sample.

Summary and Conclusion

Thus the total study consisted of 12 substudies each conducted independently but closely coordinated with the others. Although each of the studies had a specific focus, they all had a common goal--the investigation of student vocational development--and in each special attention was paid to the curriculum identification of the student as a possible determinant of his growth.

Chapter 5

Curriculum Differences in the American High School

As an early step in the program of research described in this report, field trips were made to each of the high schools participating in the Growth Study, and at each school interviews were conducted with randomly selected students. An inevitable question was "What do you plan to do when you graduate?" and then additional questions probed for the origins of whatever plans the student described. In some large fraction of the responses a reference was made to one or more subjects taken by the student. "I liked the math courses I took so I decided to go into engineering" was a typical response. It was clear that the high school curriculum is a key ingredient in vocational development. In this chapter some descriptive aspects of U. S. high school curricula will be described, along with some speculation about the implications of the differences observed. The study relied on the Growth Study as a source of data. The distribution of the Growth Study eleventh graders by curriculum will be given, and the questionnaire and test performance of students in various curricula will be summarized. The general objective of the analyses was to detect systematic individual differences between students who identify with the various programs, and to see what implication the differences may have.

In the Background and Experience Questionnaire (BEQ) which was completed by the grade 11 students in 1967, the following question was included:

125. From the list below, which course of study are you taking in high school?

A. Academic or college preparatory
B. Agricultural
C. Business or commercial
D. General
E. Home economics
F. Vocational
G. Other*
H. Undecided

*What?_____

Table 2 summarizes the responses of the students. For the total sample, 50% indicated they were in the academic course of study. This varied from 1% for the vocational high schools (That any students at all gave such a response probably resulted from a misinterpretation of the question) to 93% in the high school in West Lafayette, Indiana, the location of the University of Indiana. One-sixth were enrolled in business or commercial curricula, 1/7 in general, 1/12 in vocational programs, and the balance in assorted programs. Our observation is that in most schools the general program was a catch-all for students who chose not to take, or could not qualify for, a better defined course of study.

Table 2

Distribution of 1967 11th Graders by Curriculum and High School

	Total	Acad.		Agri.		Bus.		Gen.		Home Ec.		Voc.		Other		Undec.	
	f	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Cohasset	99	80	81	2	2	9	1	8	8	0	0	0	0	0	0	0	0
Academy	442	179	45	1	0	157	36	67	15	2	0	1	0	3	1	14	3
East	305	116	38	3	1	69	23	107	35	2	1	1	0	2	1	5	2
St. Vincent	510	296	58	5	1	153	30	30	6	5	1	2		1	0	18	4
Mem. Tech.	258	3	1	0	0	29	11	3	1	3	1	207	80	12	5	1	0
Ipswich	132	75	57	1	1	39	30	0	0	0	0	14	11	3	2	0	0
Warwick	133	82	62	7	5	19	14	9	7	2	2	3	2	6	5	5	4
Buchtel	422	216	51	5	1	82	19	101	24	3	1	3	1	1	0	11	3
Firestone	430	370	86	0	0	18	4	30	7	3	1	1	0	2	0	6	1
Kenmore	298	167	56	4	1	3	4	116	39	1	0	1	0	3	1	3	1
South	215	36	17	6	3	70	33	93	43	1	0	1	0	5	2	3	1
Hower Voc.	166	2	1	0	0	3	2	0	0	1	1	157		2	1	1	1
Bronson	149	47	32	6	4	25	17	38	26	13	9	18	12	1	1	1	1
Frazee	102	30	29	13	13	18	18	13	13	4	4	14	14	1	1	9	9
Mt. Healthy	294	111	38	1	0	70	24	70	24	6	2	7	2	8	3	21	7
W. Lafayette	162	150	93	0	0	2	1	4	2	2	1	1	1	0	0	3	2
Havre DeGrace	179	73	40	6	1	64	36	16	9	1	1	21	12	1	1	2	1
Lampasas	113	71	63	6	5	4	4	5	4	6	5	12		2	2	7	6
Yazoo City	146	85	58	2	1	4	3	10	7	2	1	33	23	8	5	2	1
Vashon Is.	123	85	69	1	1	3	2	21	17	3	2	2	2	1	1	7	6
Elma	109	39	36	10	9	13	12	21	19	0	0	6	6	4	4	16	15
La Junta	135	93	69	1	1	9	7	23	17	0	0	1	1	1	1	7	6
Castlemont	433	164	58	4	1	109	24	69	16	11	3	17	4	22	5	43	10
Oakland	372	180	48	2	1	57	15	53	14	4	1	21	6	13	3	42	11
Skyline	688	492	73	3	0	31	5	80	12	2	0	23	3	12	2	45	7
Total	6,415	3,242	50	89	1	1,060	17	987	13	77	1	567	9	114	2	272	4

To check on the validity of the questionnaire responses we occasionally, in interviews, asked students what course of study they were enrolled in or what curriculum they were enrolled in. We were surprised to discover that a substantial fraction--perhaps as many as 1/5--did not know how to answer our question. This was particularly true in the California schools, where it simply is not a meaningful question. Most of these students do not perceive themselves as being in a particular curriculum or course of study; they elect subjects in accordance with their post-high school plans or, if they do not have any definite plans, they sample subjects which sound interesting. This practice is no doubt related to the fact that in California any 18-year-old can be admitted to a junior college, even without being a high school graduate.

Curriculum Differences

In further pursuit of differences among the curricula, the BEQ responses of the students in each curriculum were examined. Selected responses will be described here; complete tables are included in Appendix E.

Subjects Taken. Table 3 summarizes the major differences in subject enrollments among the curricula as far as grades 9 and 10 are concerned. (The results reported are based on questions 172 through 177 of the BEQ. English and literature were omitted from the questionnaire in the belief that the responses would not discriminate among the students.) The major distinction would seem to be that the academic students enrolled in foregin languages, while the non-academic students enrolled in vocational courses (home economics, shop, agriculture, etc.); other enrollments for the two groups were roughly similar. "Business" and "general" were similar, except that the General students took less foreign language and less mathematics.

Occupational Planning. When asked as eleventh graders whether "during the last two years" they had seriously considered any occupations for their life work (Q.110), 25% of the total sample reported they had not. Considering that these respondents were in the 11th grade, it is surprising that so large a percentage would give such a report. For the various curriculum groups the percentages who had not seriously considered any occupations varied from 22% for the academic and the business students to 39% for those who reported they were enrolled in the general curriculum. This reinforces the conception of the general curriculum as a program for students who do not as yet have any occupational plans.

The same pattern of responses was observed on the next question (Q.111), in which the respondents were asked about their plans for the year after graduation from high school. Eighty-five percent of the academic students reported they had fairly definite plans, while only 59% of the general students reported so.

The students' plans are summarized in Table 4. It is interesting that a significant fraction of the students enrolled in each of the nonacademic curricula reported that they planned to attend a four-year

Table 3

Median Number of Semesters of Certain Subjects
Taken by Students in Various Curricula
During 9th and 10th Grades

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.
Business & Commercial	0	1 or 2	1 or 2	1 or 2	1 or 2	0
Foreign Languages	3 or 4	0	1 or 2	0	1 or 2	0
Social Studies	3 or 4	3 or 4	3 or 4	3 or 4	3 or 4	3 or 4
Home Ec., Shop, Agri., Voc'l.	0	3 or 4	1 or 2	1 or 2	3 or 4	3 or 4
Math	3 or 4	3 or 4	3 or 4	1 or 2	1 or 2	3 or 4
Sciences	3 or 4	1 or 2	1 or 2	1 or 2	1 or 2	3 or 4

Table 4

Students' Plans Following Graduation by

Curriculum (Q. 112)

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.
Full time job or military service	5%	32%	17%	24%	21%	28%
4-year college	62%	20%	13%	16%	19%	18%
School or college other than 4-year college	16%	12%	23%	14%	8%	16%
Housewife	1%	4%	5%	5%	10%	2%
Other	5%	13%	19%	12%	16%	13%
No response	11%	19%	23%	29%	26%	23%
Total	100%	100%	100%	100%	100%	100%

college. In the follow-up study to be reported in Chapter 11, this was found to be the actual case. High school curriculum identification is by no means as highly related to post-high school occupation as one might assume it to be.

As eleventh graders an average of only 22% of the "non-academic" students had "fairly definite plans" to obtain a full-time job or enter the military service on graduation. The highest proportion (32%) was reported for students enrolled in agriculture.

Family Background. Another series of questions inquired about the family background of the students in the various curricula. Here we find a weak association between the curriculum identification of the students and the level of parents' education. Thirty-two percent of the fathers of academic students were college graduates, whereas an average of 8% of the fathers of students enrolled in non-academic programs were college graduates. Similarly, 18% of the academic students' fathers were professionals, while an average of only 4% of the others' fathers were. Also present is evidence of the tendency for children to follow in their fathers' footsteps, a finding widely reported in the sociological literature. For example, 12% of the agricultural students' fathers were farm managers, whereas only 2% of the others' parents were. These questions will be discussed further in Chapter 11.

Peer Group Influences. Which program the student identifies with is also related to the plans his friends have. Seventy percent of the academic students report that 60% or more of their friends plan to attend a four-year college while only 28% of the non-academic students report that that high a percentage of their friends plan to attend a four-year college. The direction of causality is, of course, uncertain. Identifying with a college preparatory course may merely result in one acquiring friends who also plan to attend college.

Parental Influences. The next pair of items concerned parents' feelings about their children's continuing their education beyond high school (items 120 and 121). As one might expect, a much higher percentage of the parents of academic students strongly favored their children's continuing their education, with mothers feeling slightly stronger about it than fathers. Eighty-eight percent of the "academic" mothers strongly favored their children's continuing their education, vs. 54% of the "non-academic" mothers, while 85% vs. about 52% of the fathers felt so.

Perception of Courses. Next the students in various curriculum programs were asked to indicate which subjects they were enrolled in, and whether the course was boring or interesting. Ninety-five percent of all students were enrolled in athletics or physical education, and 68% of them found the courses interesting, a higher percentage of the academic students finding it interesting (70%) than of the others (64%).

Eighty-eight percent of the business students took typing, but so did approximately 55% of the other students. Sixty-seven percent of the business students found it interesting, while only about 35% of the non-business students did.

The figures for business-commercial courses are similar, except that only a small percentage (16%) of the academic students enrolled in such courses.

Driver's education was taken by a fairly uniform 62% of the students, with a fairly uniform 42% finding it interesting, as opposed to about 8% who found it boring.

English and literature were taken by practically all students, the lowest percentage being 92% for the agricultural students. Fifty percent found it interesting, ranging from 31% of the agricultural students to 60% of the academic students.

Foreign languages, however, were taken by less than half of the non-academic students, while 92% of the academic students studied them. The academic students also liked them better; 54% found them interesting versus approximately 35% for the non-academics.

Nearly all students took one or more social studies course, and a higher percentage found it interesting than the percentage finding English and literature interesting. Again, more of the academic students found social studies interesting than did the non-academic students (63% vs. approximately 42%).

The situation was reversed with home economics, shop, agriculture, and other vocational courses. Almost one-half (49%) of the academic students had taken none of these courses, while only 20% of the non-academic students had not taken any. Eight percent of the home economics, and 5% of the vocational students, said they had not taken these courses, a puzzling report.

A very high proportion of those who did take vocational c s found them interesting. Mathematics and science were similar. Practically all of the academic students took these subjects, 85% of the non-academic students did. Most of the academic students found the courses interesting--more found science interesting than any other academic course--while the non-academic students found them less so, although more found them interesting than boring.

The ratings of the various courses are summarized in Table 5. If the ratio of the number finding a subject interesting to the number finding it boring is acceptable as an index of student interest, we can say that the vocationally oriented courses met with the most interest, while foreign languages met with the least interest. Driver's education ran a close second in interest, while mathematics was close to foreign languages in lack of interest. Why driver's education should have such a high index value is of interest. The data indicated that it resulted primarily from relatively few students' finding it boring.

Within curricula there were some interesting deviations from the overall means. The academic students found science most interesting and agreed with the other groups that foreign languages were least so. The business students rated social studies least interesting, as did the home economics students.

Table 5

Ratio of Number of Students in Each Curriculum Finding Certain Subjects Interesting to Number Finding Them Boring

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Means
Home Ec., Shop, Agri., Voc'l.	4.0	3.9	5.6	6.8	13.0	19.8	8.8
Driver's Education	4.3	4.6	5.9	5.0	10.5	14.0	7.4
Typing	3.0	1.0	11.1	2.8	2.0	3.5	3.9
Business & Commercial	3.0	1.2	10.0	3.4	1.4	2.5	3.6
Science	6.3	2.6	2.1	2.6	2.0	2.5	3.0
English & Literature	4.3	1.2	2.4	1.4	1.7	1.0	2.0
Social Studies	3.7	1.4	1.2	1.7	1.1	2.2	1.9
Math	3.4	1.0	1.4	1.2	1.3	1.4	1.6
Foreign Languages	2.2	1.2	1.3	.9	1.5	1.1	1.4
Means	3.8	2.0	4.6	2.9	3.8	5.3	3.7

When we examine the mean interest of each curricular group, we see that the vocational students reported the greatest interest, i.e., the mean of the ratios across subjects was largest for them. At the other extreme were the agricultural students with a ratio of "interesting" to "boring" of 2.0.

Anticipated Utility. Table 6 summarizes a series of items in response to the question "Do you think the following courses will be useful in helping you earn a living?" Generally, as one might expect, the vocationally oriented courses were perceived as most useful, and foreign languages were consistently perceived as least useful. Judging from the mean ratios across subjects, the business and commercial students perceived their program as most useful, while the agricultural students viewed their program as least useful.

The rank order correlation between the interest indices and the usefulness indices was .70, suggesting the hypothesis that students tend to regard as interesting those courses that they perceive as useful. The direction of causality could, of course, be reversed. An alternative hypothesis would be that the correlation results from a methods factor common to both items.

Changes Over Time

To further describe the differing experiences of the students in the various curricula, their questionnaire responses were examined at three points: grade 7, grade 9, and grade 11. Figure 5 shows the results for one variable: whether the respondent found mathematics to be interesting or not. Since this variable is correlated with ability, the two major curriculum groups (academic and non-academic) were subdivided into high- and low-ability groups, with the comparable ability groups being matched man-for-man on the basis of their estimated true grade 7 Total scores on the School and College Ability Test (SCAT)[1]. In other words, at the grade 7 level, the High-Ability Academic students had the same distribution of estimated true SCAT Total scores as the High-Ability Non-Academic students and, similarly, the two low-ability groups. Matching on estimated true scores was an effort to reduce the kind of regression towards the mean which occurs when subjects are selected from two populations with different means.

It seems unlikely that the distinct changes which can be observed in Figure 5 are still attributable to regression, but the possibility exists, since the academic and non-academic students were <u>not</u> matched on a number of additional variables which might account for the observed differences--socioeconomic status and school attended, for example. For this reason, the results for other variables will not be reported here. It is interesting to note, nevertheless, that the percentage finding mathematics interesting increased from the seventh to the ninth grade and then for all groups decreased from the ninth to the eleventh grade. Does this possibly say something about the effect of studying mathematics at the high school level?

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[1] True scores were estimated by regressing each student's observed score towards the mean of his group (i.e., academic or non-academic) using reliabilities computed for the total Growth Study sample.

Table 6

Ratio of Number of Students in Each Curriculum Perceiving Subjects as Useful to Number Perceiving Them as Not Useful

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Means
Home Ec., Shop, Agri., Voc'l.	1.6	5.6	2.5	6.1	9.8	19.8	7.6
Driver's Education	2.5	7.1	5.7	5.3	5.3	5.4	5.2
Typing	7.3	2.9	27.2	5.0	9.5	3.1	9.2
Business & Commercial	2.8	3.0	39.0	6.7	4.8	4.7	10.2
Science	4.2	2.9	.8	1.7	1.6	1.8	2.2
English & Literature	11.0	2.1	9.2	5.7	4.7	4.1	6.1
Social Studies	2.3	1.5	1.3	1.7	1.2	1.7	1.6
Math	7.1	2.6	3.9	4.6	2.9	8.0	4.8
Foreign Languages	1.6	.5	.8	.8	1.4	.5	.9
Means	4.5	3.1	10.0	4.2	4.6	5.4	5.3

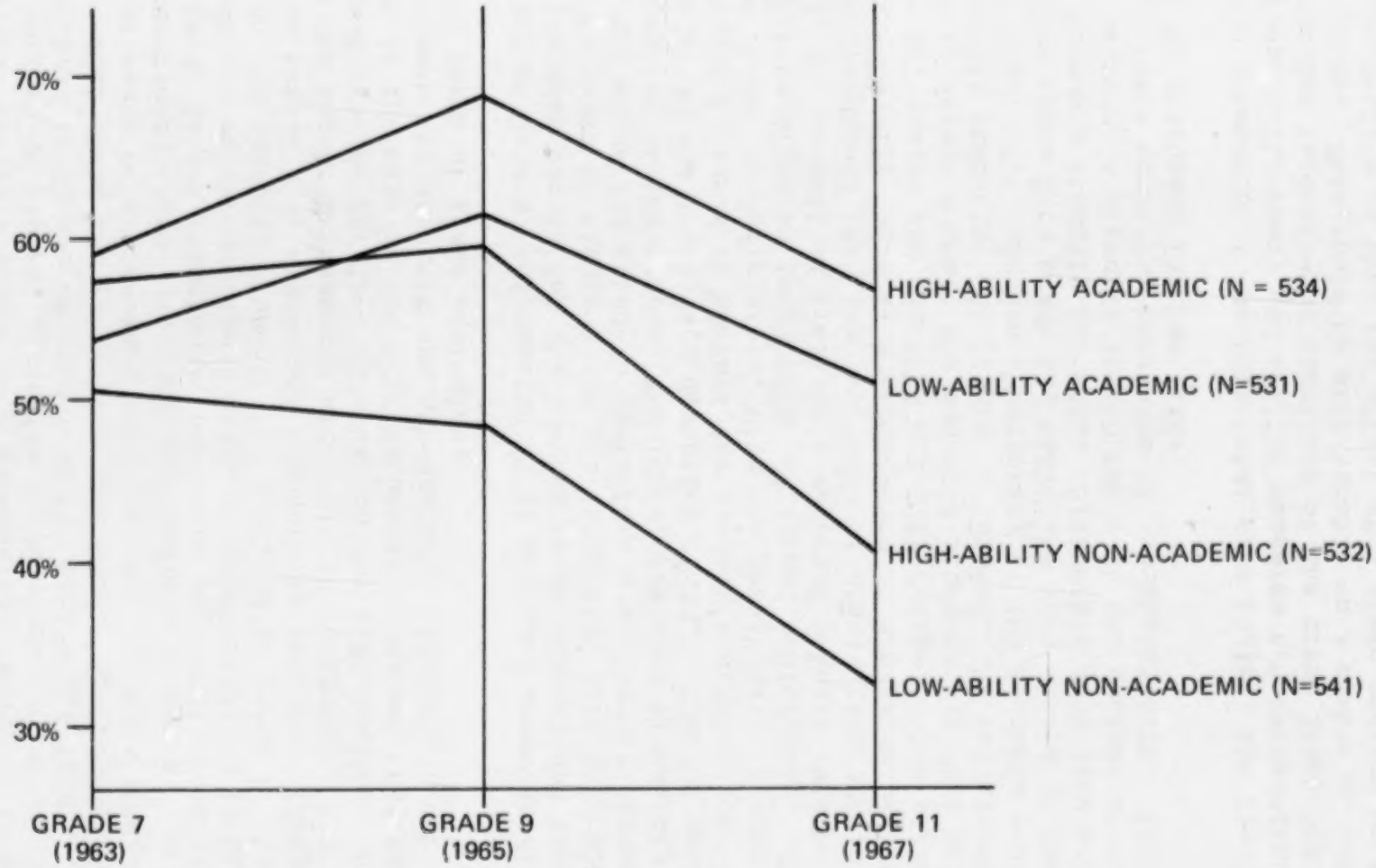

Figure 5. Percentages of Academic and Non-Academic Students finding Mathematics Interesting.

Test Performance

The last descriptive results to be reported concern the test performance of the students in various curriculum groups. Figure 6 shows the mean scores for STEP Mathematics for grades 5 through 11. The samples in question are longitudinal; that is, the same students are involved at each grade level. (The requirement of complete data over a six-year period resulted in a substantial reduction in sample N's. Two curriculum groups, agricultural and home economics, whose N's were reduced to 23 are omitted from the tables and figures.) The mean differences among the groups are startling. At grade 11 approximately four years of achievement separates the academic students from the vocational, home economics and business students. In other words, by grade 11 the vocational, business, and home economics students achieve on the average a level of sophistication in mathematics which the academic students had achieved in grade 7. Table 7 provides the sample N's, means, and standard deviations. (Comparable statistics for the other measures are included in Appendix E) Figure 7 and Table 8 provide parallel information for STEP Reading. Generally the picture is the same as for STEP Mathematics, except that the discrepancy between the academic and non-academic students is not quite as large, in terms of grade equivalents.

The Test of General Information (TGI) provided somewhat different results. The mean scores for the 10-item Entertainment and Recreation subscale are shown in Figure 8 and the Industrial Arts subscale in Figure 9. The means and standard deviations are given in Appendix E (For the purposes of the graphs, the TGI scores were standardized with a mean of 50 and a standard deviation of 10.) The TGI scales were originally designed to measure the student's acquisition of information in non-academic areas, with the possibility in mind that such acquisition might be independent of school achievement. The present results, as well as previously reported results (Hilton & Myers, 1967), indicate that the two kinds of acquisition are not independent. Usually there is a correlation of approximately .60 between the TGI scales and the SCAT and STEP scales. This correlation can be seen in Figure 8 where the academic students are well above the non-academic students. In Figure 9, however, the relationships change over time. The relative superiority of the academic students decreases from grade 5 to grade 11, while the mean scores of the vocational students steadily increase. Presumably this reversal of the growth pattern is directly attributable to the content of the scale, i.e., items measuring knowledge of industrial arts. This matter will be discussed further later.

With the exception of the Industrial Arts scales, the figures for the various achievement and ability measures are extraordinary in one particular respect--the stability of the trend lines for each curriculum group. This could be attributable to a number of conditions. The first possibility is that the effect of a given curriculum is to preserve the status quo or, more precisely, to maintain the past growth record of selected groups of students, i.e., the students in each curriculum. A second possibility is that the effect of a given

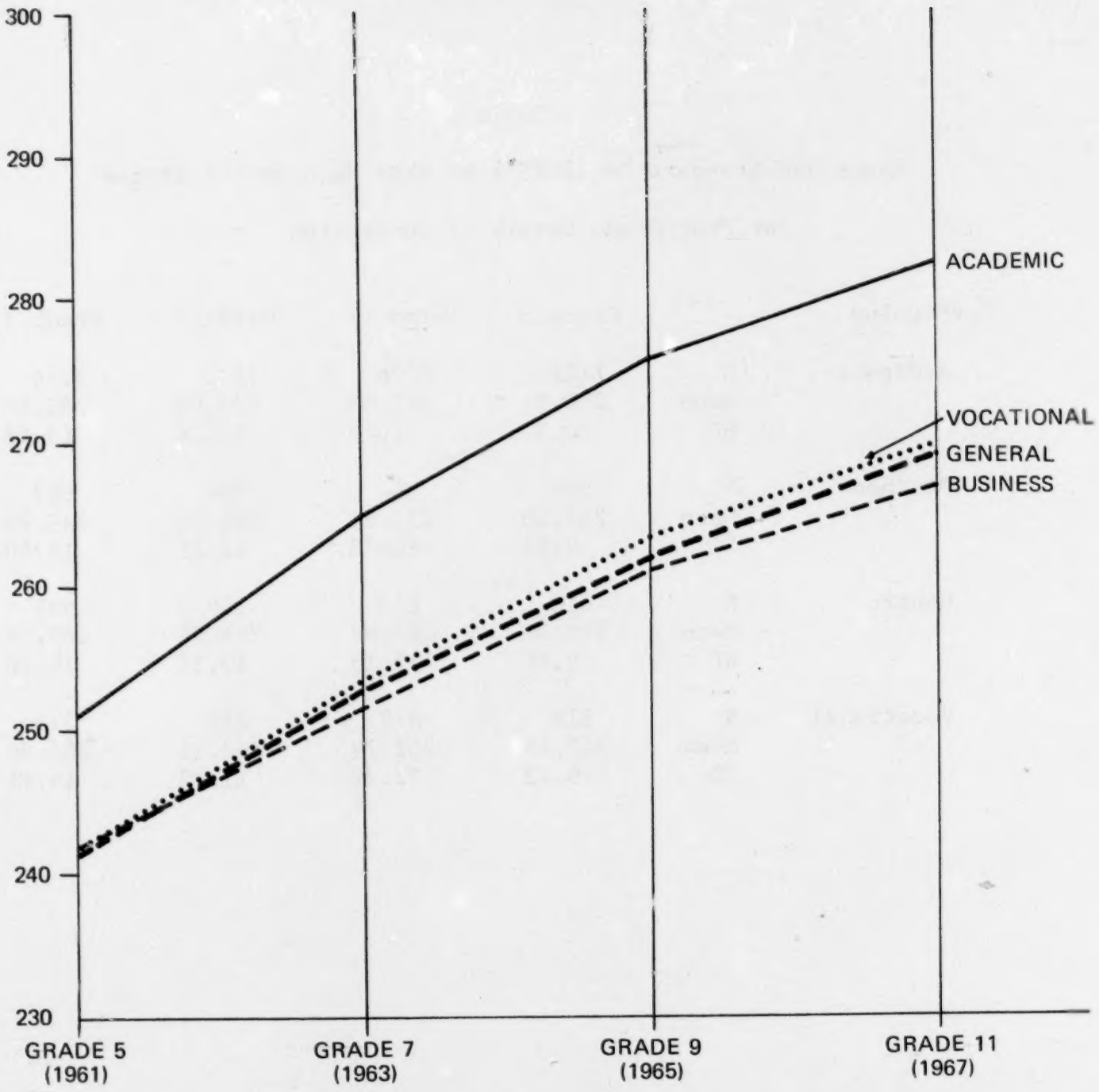

Figure 6. Mean Scores on STEP Mathematics for Four Major Curriculum Groups

Table 7

Means and Standard Deviations of STEP Mathematics Scores

at Four Grade Levels by Curriculum

Curriculum		Grade 5	Grade 7	Grade 9	Grade 11
Academic	N	2111	2076	1893	2074
	Mean	250.91	264.88	275.63	282.45
	SD	10.54	12.43	12.16	13.78
Business	N	679	664	664	653
	Mean	242.36	251.66	261.39	266.70
	SD	9.11	12.22	12.35	15.50
General	N	618	603	599	592
	Mean	242.02	251.97	261.58	267.26
	SD	9.80	13.13	13.35	16.66
Vocational	N	319	312	310	313
	Mean	242.15	252.79	263.51	268.86
	SD	9.22	12.22	11.82	15.44

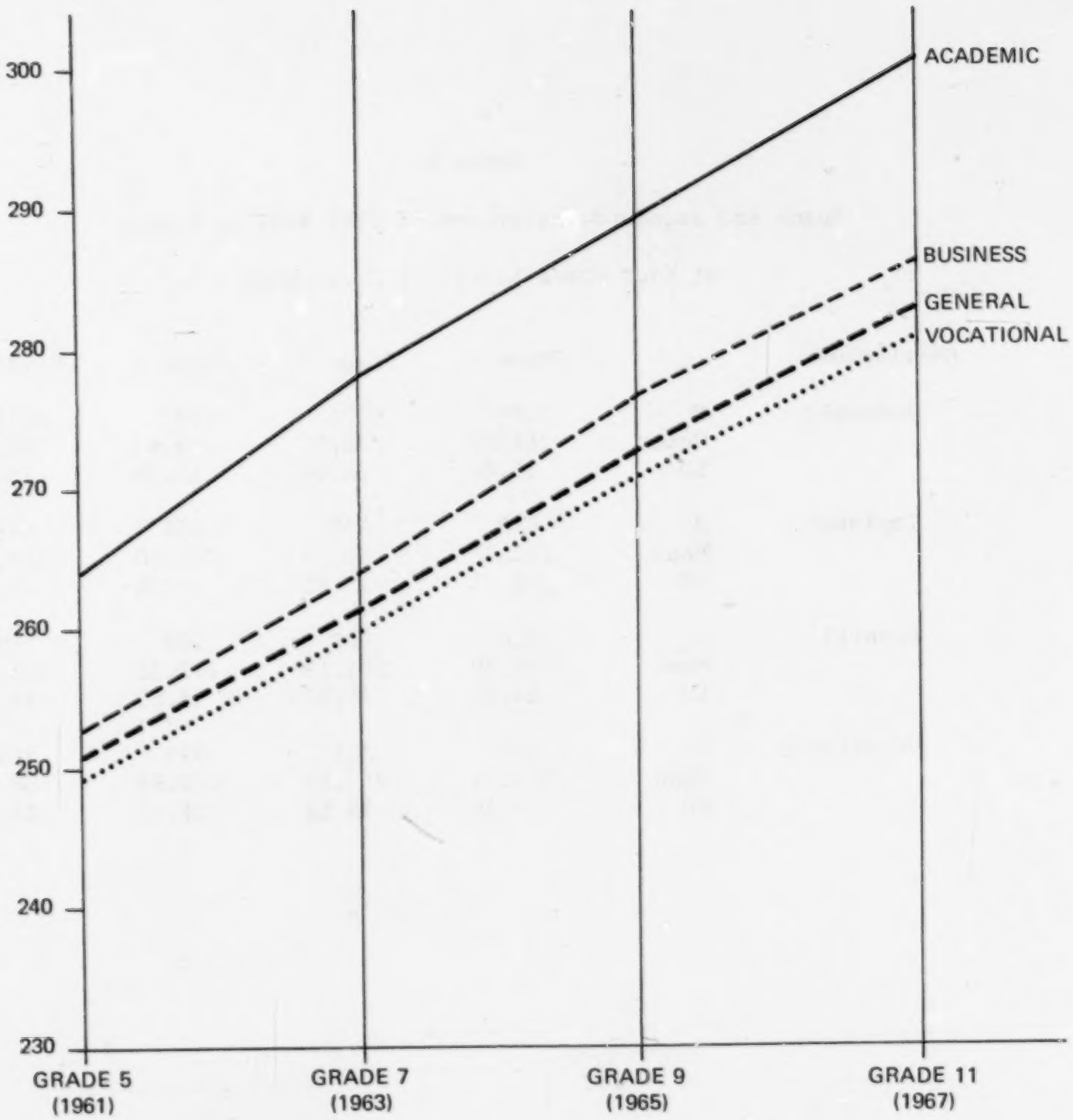

Figure 7. Mean Scores on STEP Reading for Four Major Curriculum Groups

Table 8

Means and Standard Deviations of STEP Reading Scores

at Four Grade Levels by Curriculum

Curriculum		Grade 5	Grade 7	Grade 9	Grade 11
Academic	N	2109	2071	1892	2075
	Mean	264.09	278.01	288.93	300.74
	SD	15.88	16.00	13.54	15.15
Business	N	678	659	664	648
	Mean	252.78	263.93	276.60	286.56
	SD	13.23	15.35	15.36	15.67
General	N	616	608	600	580
	Mean	250.70	261.49	272.31	282.80
	SD	14.16	16.27	16.63	16.95
Vocational	N	319	311	313	316
	Mean	249.53	260.29	270.98	280.89
	SD	13.01	15.88	16.55	17.96

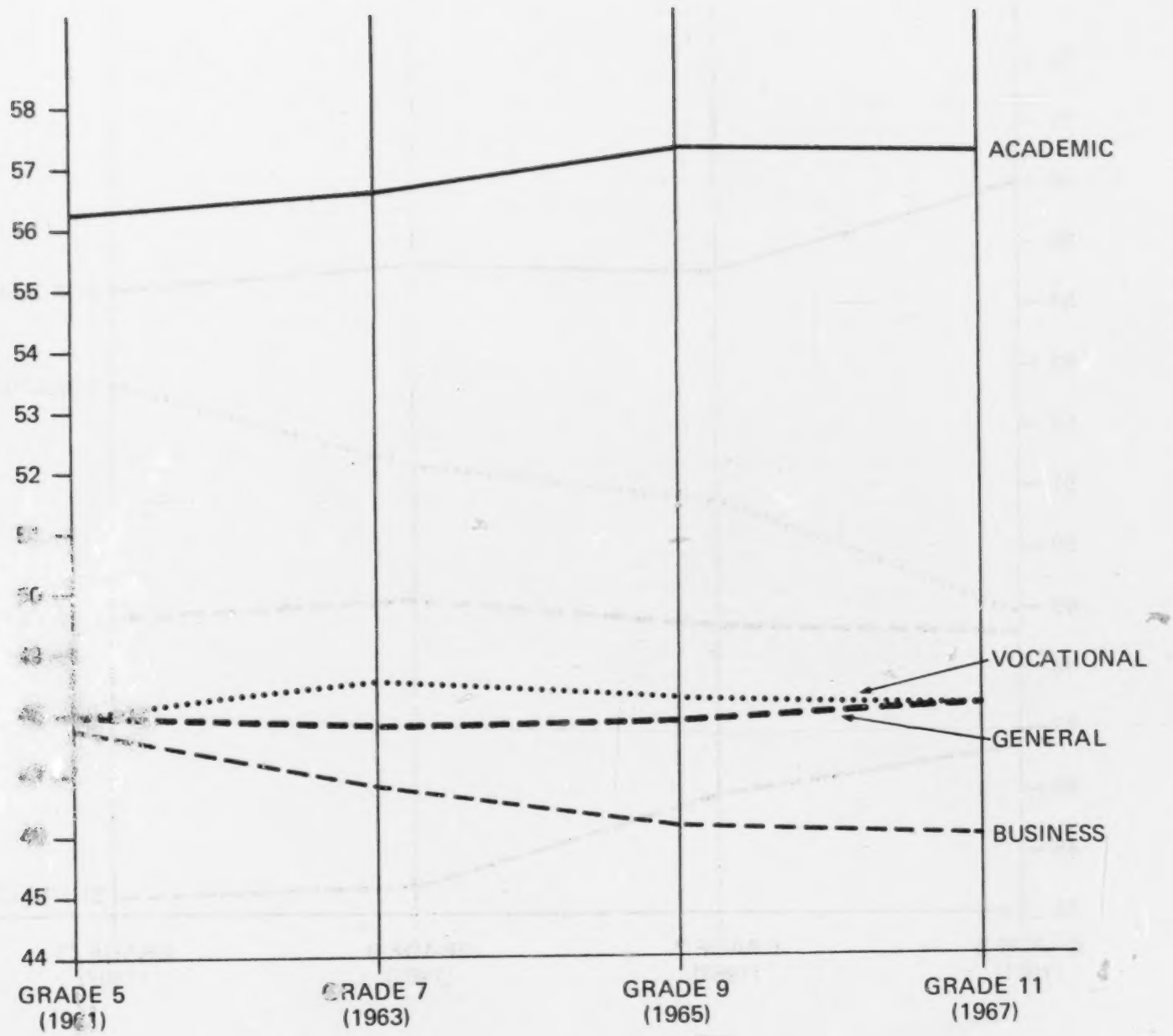

Figure 8. Mean Standardized Scores on TGI Entertainment and Recreation Scale by Year and Curriculum.

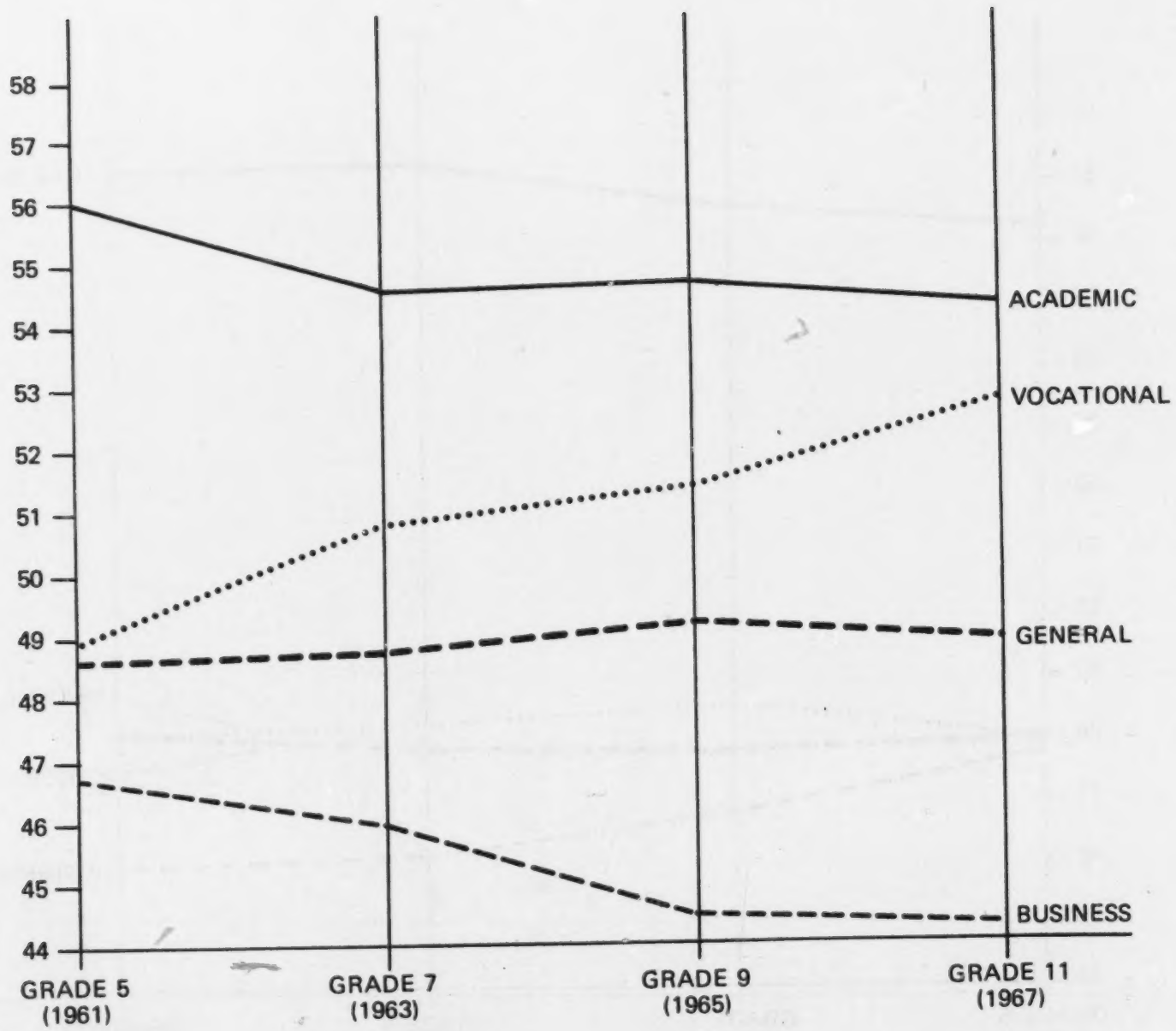

Figure 9. Mean Standardized Scores on TGI Industrial Arts Scale by Year and Curriculum.

curriculum is negligible--students continue to achieve at whatever growth rate they have exhibited in the past. A third conception differs only in emphasis from the previous two. This is the view of the high school as a student sorting device. A student's achievement level, self-concept and interests are accepted as given. The problem of the school administration is, through trial and error, to find a program of subjects which fits the student, especially in terms of his achievement level. If the "first" algebra group is too fast for the student, he will be transferred immediately or at the beginning of the next semester to a slower algebra group. If he fails algebra the first time he takes it he is encouraged to repeat it. If he fails it again he is assigned to general mathematics or business arithmetic, possibly with attention paid to who teaches the course (How demanding is Mr. X?) or who is enrolled in it (Is it a "fast" group or a "slow" group?). Finally he may be permitted to drop mathematics altogether, a step which may involve his disaffiliating from a program of study, e.g., a vocational course, which he had been pursuing.

The exact path followed differs widely from one high school to another, depending--our observations suggest--on the unique history and current staffing of each high school. Visits to the 28 high schools in the Growth Study sample revealed a surprising heterogeneity as far as curriculum offerings and procedures are concerned. One strong-minded and respected (or feared) high school department head can have an all-important and lasting effect on the offerings, textbook selection, and teaching and administrative procedures of a particular school. But a primary objective seems to be common to all school administrators--to find a classroom in which each student can survive the school year.

Summary and Conclusion

In this chapter the questionnaire responses and test performance of students identified with various high school curricula have been described in an effort to discern, first, the operational significance of the term "vocational education" in the United States and, second, some of the implications of the term for student growth and development.

The research was limited to self-report questionnaires and conventional measures of achievement (the School and College Ability Tests, the Sequential Tests of Educational Progress and the Test of General Information). The limitations of these tests as measures of the educational growth of all the students in a comprehensive high school give rise to the first conclusion from this descriptive study, namely that our measures of student growth, especially of students in "non-academic" programs, are woefully deficient. It is important to measure growth in reading skills, understanding of science and social studies; and adequate measures of such cognitive skills are available. It is equally important to have measures of students' vocational skills, including such elusive qualities as respect for craftsmanship, work values, and human relations skills. (An inkling of the kind of growth which may be observed is seen in the analysis of the industrial Arts Scale of the Test of General Information.)

We would, therefore, fully endorse the following statement: "Traditionally, schools have measured growth by achievement in subject matter alone. Much of such growth may be irrelevant. We have to start measuring growth by how much a school prepares a student, from his very earliest days, to contribute something useful to the society he's going to live in."[2]

As far as questionnaire responses were concerned, 50% of the total sample of 11th graders regarded themselves as taking the "academic or college preparatory" course, although interviews indicated many students were uncertain of their response. What curriculum a student is identified with has become for many students an irrelevant question, particularly in schools in the West. With the rapid growth of open-enrollment colleges it is no longer necessary--whether desirable or not--for a student to complete a prescribed program of college preparatory subjects. It was not unusual for students who planned to enroll in a two- or four-year college to take what would formerly have been regarded as a straight program of vocational preparation, a program in television repair, for example.

From school to school wide variation was observed in the proportions enrolled in various programs. How many students were enrolled in the college preparatory (academic) program seemed to depend on a number of variables, including the presence or absence of a technical high school in the community, the presence or absence of an open-enrollment junior or four-year college in the community, the socioeconomic level of the parents of the students in the school and local employment opportunities. (For any given school, one can predict that the number of students enrolled in the college preparatory program will be approximately 80% of the number of students with fathers who are college graduates.)

When the subjects taken by students in various curriculum programs are examined, one is struck by their similarity. The essential difference seems to be that the non-academic students substitute vocationally oriented subjects for the languages which the academic students take. But there are many exceptions. In fact, in visiting the Growth Study schools, and in examining the data files, we seldom found evidence of highly structured and clearly defined curriculum programs.

There also was no clear correspondence between the students' future plans and the programs they were enrolled in. Only 22% of the non-academic students planned to go directly into work or military service on graduation, and 16% planned to attend four-year colleges. Although our results do not permit us to say so with any certainty, we suspect that this lack of structure is desirable. For one reason, it permits greater student mobility from one curriculum program to another. Considering that few students have precise occupational plans during high school--25% of the 11th graders had not considered any occupation seriously--such mobility would seem to be necessary.

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[2]Office of Education New Directions in Vocational Education. Superintendent of Documents Catalog No. FS 5.280:80047 U. S. Govt. Printing Office, Washington: 1967.

Generally speaking, students were more interested in subjects relevant to their chosen curriculum than in irrelevant subjects. The business students were most interested in business subjects, for example, and the vocational students were most interested in vocational courses. They also regarded the most useful courses as most interesting. We also reported earlier the observation that students moved away from academic areas in which they were unsuccessful (the sorting process). All these observations suggest a complex model of student curriculum choice. Three variables in the model are past success, interest, and perceived usefulness. How these variables influence each other is questionable. As a hypothesis, we would propose that interest and choice result from past success and perceived usefulness. Later chapters in this report will return to this question.

Generally, the vocational students reported the most interest in their courses. Would these students have reported the same degree of interest if they had been forced to take the traditional college preparatory curriculum? This is a question we would like to answer, but without a controlled experiment we cannot. A method of analysis which is described in Chapter 10 may, however, permit some conclusions of this type.

Whether curriculum differences remain when earlier scores are made equal (by analysis of covariance), and when all the available measures are examined simultaneously, was investigated in a study described in the next chapter.

Chapter 6

Educational Achievement Prior to and During High School[1]

Michael J. Patton[2]

Educational achievement and scholastic ability during late childhood and adolescence have not found a prominent or well-articulated place in existing theories of vocational development (cf. Borow, 1964). Yet their relationships to "vocational maturity" and adjustment have been documented by Crites and Semler (1967). And other investigators (see Halpern, 1967; Remmers & Radler, 1957) have pointed out that adolescents regard their own past and future achievement as prominent factors to be accounted for in educational and vocational planning, as do educational researchers (Tiedeman & Sternburg, 1952).

It is not generally known, for example, what the achievement, ability and socioeconomic status are like for specific groups of students, and what relationships early differences in attributes have to later achievement and to other educational experiences. Because school guidance workers assist students in making educational and vocational plans for the manifest purpose of facilitating their intellectual and vocational development, it would seem useful to have more systematic knowledge of the prior educational achievement of students who later become associated both with a specific secondary school and with a course of study in that school. In this way it might become possible not only to predict more accurately a student's eventual curricular choice but, more important, to help the student plan his educational experiences such that the school is more likely to help, not hinder, this important aspect of development.

In a previous and informal analysis (Patton & Morse, 1967), educational achievement was observed to differ substantially among student groups in one sample as early as grade 7 when these groups were identified by sex, by the high school they attended, and by the curriculum in which they were enrolled at grade 11. Since it was not possible to establish the significance of the observed differences nor to determine their nature, these observations prompted the present study in which prior achievement, scholastic ability and socioeconomic status have been examined as correlates of the student's later achievement, his sex, the high school he attended and his curriculum choice. The purpose of this research has been to investigate the educational achievement, ability and socioeconomic status of a group of students over time.

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[1]The author wishes to express his appreciation to Thomas L. Hilton and to Charles E. Hall for their valuable assistance.

[2]Now at the University of Utah.

Method

The data with which this research is concerned were taken entirely from the Growth Study files. The data for the matched-longitudinal subsample used in this study are composed of scores at three points in time on the appropriate forms of School and College Ability Test (SCAT) and the Sequential Tests of Educational Progress (STEP).

Sample and Design

The sample of 2,952 students (1,345 boys and 1,607 girls) whose scores were analyzed were 7th graders in 1961, 9th graders in 1963, and 11th graders in 1965. In order to examine these data retrospectively by school and curriculum groups beginning at grade 7, it was necessary first to establish group identity from grade 11 data and then determine that combination of schools, curricula, and sexes which would result in as little biasing of the data as possible. A three-factorial design was formulated, in which 18 "comprehensive" high schools, five curriculum groups (i.e., undecided, vocational, business, general, and academic), and the two sexes formed the design factors. Nine variables were used in the analysis: six STEP scores, two SCAT scores, and a measure of the socioeconomic status (SES) of the student's family derived from several items in the Background and Experience Questionnaire that was included in the 1965 test administration.

Data Analysis

A multivariate analysis of variance program (MANOVA) devised by Clyde, Cramer, and Sherin (1966) was used to examine the results associated with the design factors at each of grades 7, 9 and 11. Therefore, this program provided multivariate F ratios and the probability levels of the main and interaction effects associated with the design factors. In addition, univariate F ratios corresponding to each variable were calculated and shown with each multivariate F ratio. The program also included discriminant scores, as well as both discriminant function coefficients (not reported here) and "principal components of the hypotheses" associated with a multivariate F ratio. Unlike the more common discriminant function coefficients, principal component coefficients are Pearson product-moment correlations between the canonical variate(s) associated with a multivariate F ratio and each of the variables. In other words, they are coefficients describing the relationship between the combination of all the variables (i.e., the canonical variate) which best discriminates among the groups and each of the variables separately (cf. Hall, 1967). On the basis of the principal component coefficients, the discriminant functions associated with a significant multivariate F ratio have been given tentative interpretive labels in the discussion that follows. It is recognized that even slight rotations of the vectors could result in marked changes in the size of the principal component coefficients,

and for that reason the reader is cautioned against "reifying" the discriminant function labels.

The major analyses to be reported here sought to establish a baseline with grade 7 data, and an indication of change with grades 9 and 11 data. By controlling statistically, through the use of covariance analysis, for the effect of grade 7 STEP and SCAT scores in the MANOVA of grade 9 scores, an attempt was made to learn what new differences or performance attributes were not predictable from grade 7 data. For the same reasons, grades 7 and 9 STEP and SCAT scores were introduced as covariates in the MANOVA of grade 11 data.

Procedural Checks on SES and SCAT Variables

The argument has been raised that many of the achievement differences among students are associated more with conditions outside the control of the school system than with factors controlled by the schools (cf. Coleman, 1966). Therefore, if SES is controlled statistically in such analyses, differences in achievement among students classified by curriculum and high school ought to lessen, or so the argument goes. Perhaps this might occur if the investigator is employing a verbal achievement measure that is known to be highly associated with a student's home background. If, however, several different types of reliable achievement and aptitude measures are used, the results of covarying SES may present a different picture. To examine this possibility a MANOVA was first run on 7th grade STEP and SES scores and then on 7th grade STEP scores using SES as a covariate.

The results of both analyses were practically identical. In both, small but significant multivariate F ratios occurred for the interaction between the curriculum and sex factors ($p < .001$), and larger F ratios were found to be associated each with the curriculum, sex, and school factors ($p < .001$). When SES was used as a covariate, significant multivariate F ratios occurred with the same factors, but now five instead of six significant discriminant functions were found associated with the school factor, and it is clear that achievement differences still remain. The position is taken in this research that the SES variable adds an important dimension in understanding the performance of students classified by sex, high school and curriculum in grades 7, 9 and 11.

Because of the sizable correlations between the SCAT and STEP measures it was also decided to examine whether SCAT added anything new to the analysis beyond that contributed by STEP. Table 9 reports the correlations among these two measures, and the existence of several sizable SCAT-STEP correlations provides warrant for asking what SCAT might contribute. A MANOVA was first run using only STEP and SES, and then a second analysis was conducted in which SCAT was included and STEP and SES were treated as covariates.

It will be recalled that when STEP and SES are analyzed alone a small but significant multivariate F occurred with the interaction between curriculum and sex ($p < .001$), as did larger multivariate F

Table 9

Within Cells Correlations of 7th Grade STEP and SCAT Variables
with Standard Deviations on the Diagonal

Variable	STEP Math	STEP Science	STEP Social Studies	STEP Reading	STEP Listening	STEP Writing	SCAT Verbal	SCAT Quantitative
STEP Math	SD=11.078							
STEP Science	.577	SD=9.310						
STEP Social Studies	.626	.681	SD=11.208					
STEP Reading	.604	.627	.713	SD=13.784				
STEP Listening	.555	.598	.685	.683	SD=11.894			
STEP Writing	.608	.620	.691	.752	.627	SD=13.184		
SCAT Verbal	.597	.635	.702	.758	.719	.707	SD=10.493	
SCAT Quantitative	.669	.527	.599	.570	.504	.582	.570	SD=11.223

ratios for the curriculum, sex and school factors ($p < .001$). The analysis of 7th grade SCAT scores when STEP and SES were treated as covariates revealed that the curriculum-sex interaction was no longer significant ($p < .390$), but that multivariate F ratios for curricula ($p < .001$), sex ($p < .002$) and schools ($p < .001$) were. Table 9 notwithstanding, these results suggest that the two SCAT measures contribute useful information to the examination of differences among groups, beyond that afforded by STEP and SES, and that this is especially so in the case of differences associated with the curriculum, sex and school factors.

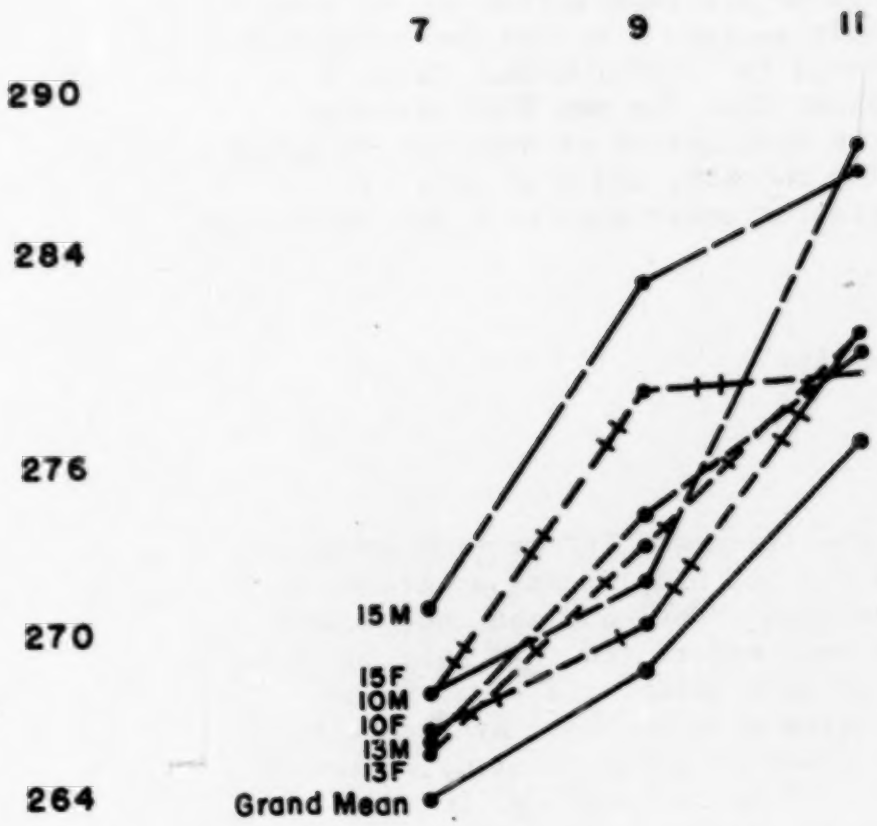
Results

Interactions

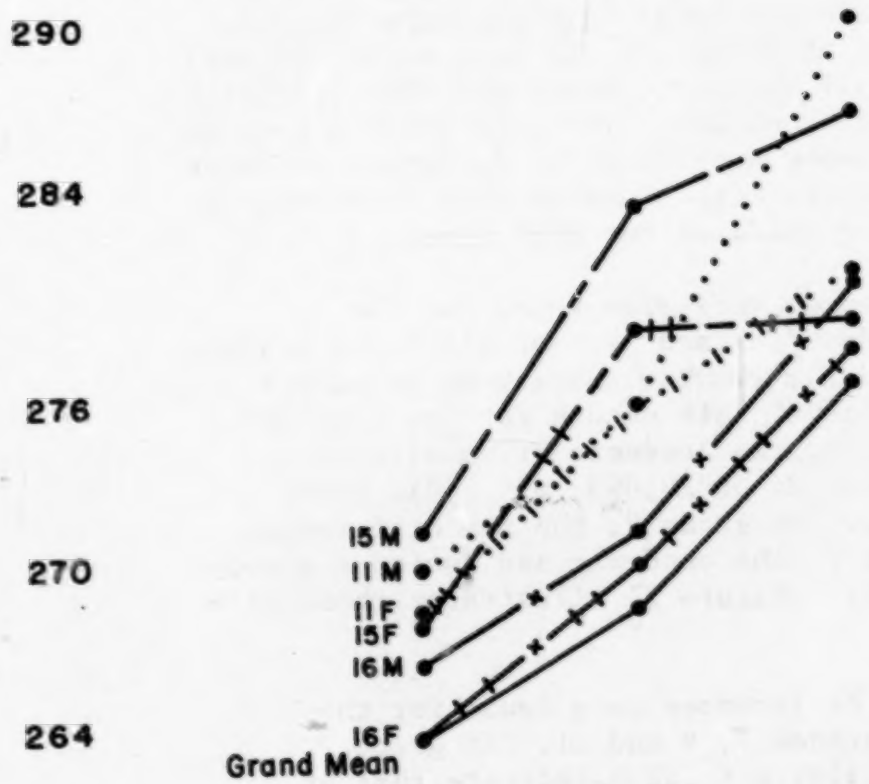
The multivariate F ratio for the three-way interaction among schools, sex and curriculum groups was not significant at grades 7, 9 or 11. The two-way interactions between school and sex, curriculum and sex, and school and curriculum were associated with very small but significant multivariate F ratios at each grade. In view of the smallness of the differences associated with the two-way interactions, little interpretive weight will be given to these results. Instead the reader is referred to Figure 10, where the small differences associated with the school-sex interaction are illustrated. The school-sex interaction was significant at grades 9 ($F = 1.290$, df 153/22,798, $p < .009$) and 11 ($F = 1.734$, df 153/22,734, $p < .001$, and $F = 1.382$, df 128/22,442, $p < .003$), particularly for achievement in STEP Science. The upper half of Figure 10 illustrates the pattern of school-sex differences in STEP Science for those schools where this relationship was most divergent at grade 9, while the lower half portrays the same thing for the most divergent cases at grade 11. In both cases the most divergent school-sex groups were all above the mean, and that statistic has been plotted to provide further contrast. The relationship between boys' and girls' gains on STEP Science appears to be different in these different schools, although in schools with close to zero discriminant scores, the STEP Science curves are the same for both sexes.

Small but significant differences were also found for the curriculum-sex interaction at grades 7, 9 and 11. At all three grades, the significant sex differences within curricula are most prominent on STEP Science, and at grades 7 and 11 this occurs for the boys and girls who eventually enroll in either the academic or vocational programs (i.e., grade 7: $F = 2.241$, df 36/10,693, $p < .001$; grade 11: $F = 2.131$, df 36/10,633, $p < .001$). At grade 9, the sex differences in STEP Science are most divergent in the academic and business groups ($F = 1.558$, df 36/10,663, $p < .018$). Figure 11 illustrates these differences.

Again, small but significant differences were found for the school-curriculum interaction in grades 7, 9 and 11. At grade 7, the results ($F = 1.182$, df 243/24,454, $p < .028$) indicate that on a significant discriminant function defined primarily by a principal



Gains in STEP Science from grade 7 to 9 for those schools in which the sexes are most dissimilar at grade 9



Gains in STEP Science from grade 9 to 11 for those schools in which the sexes are most dissimilar at grade 11

Figure 10. Plot of unadjusted STEP Science mean scores associated with the School-Sex interaction.

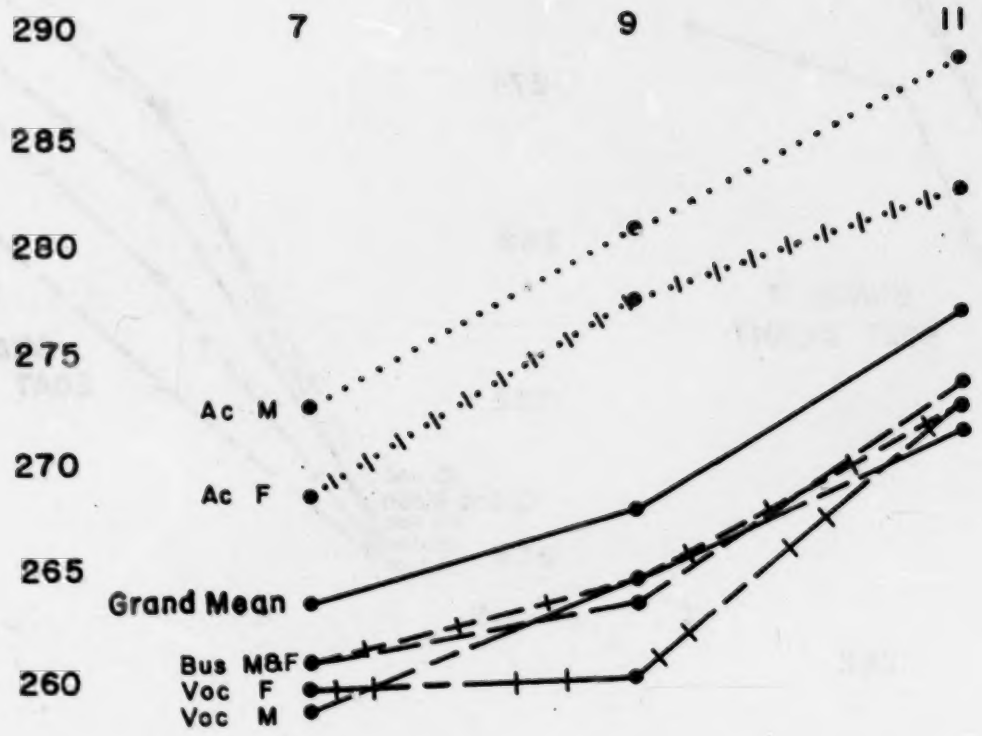
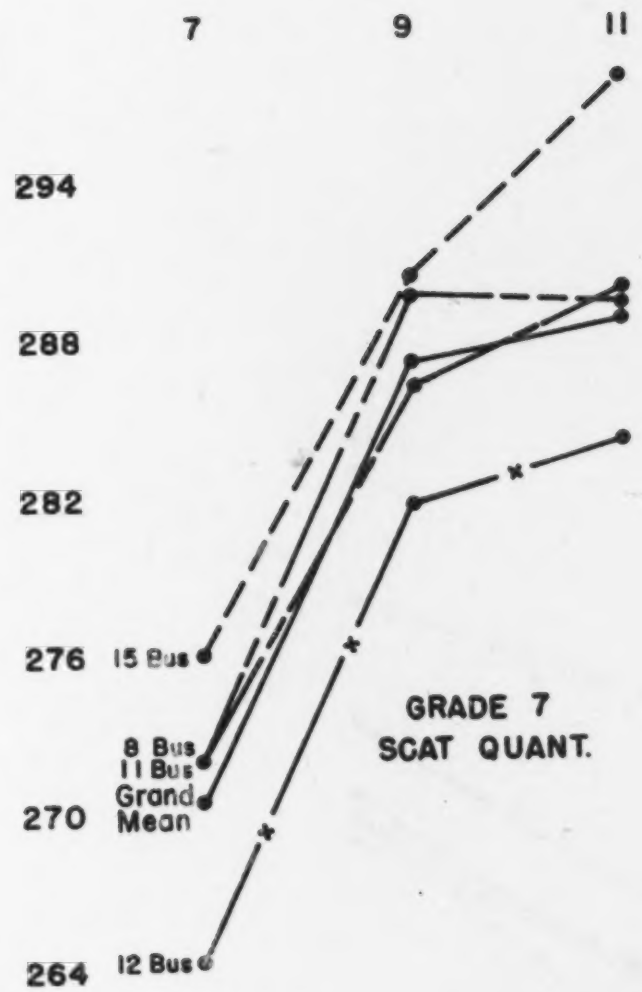
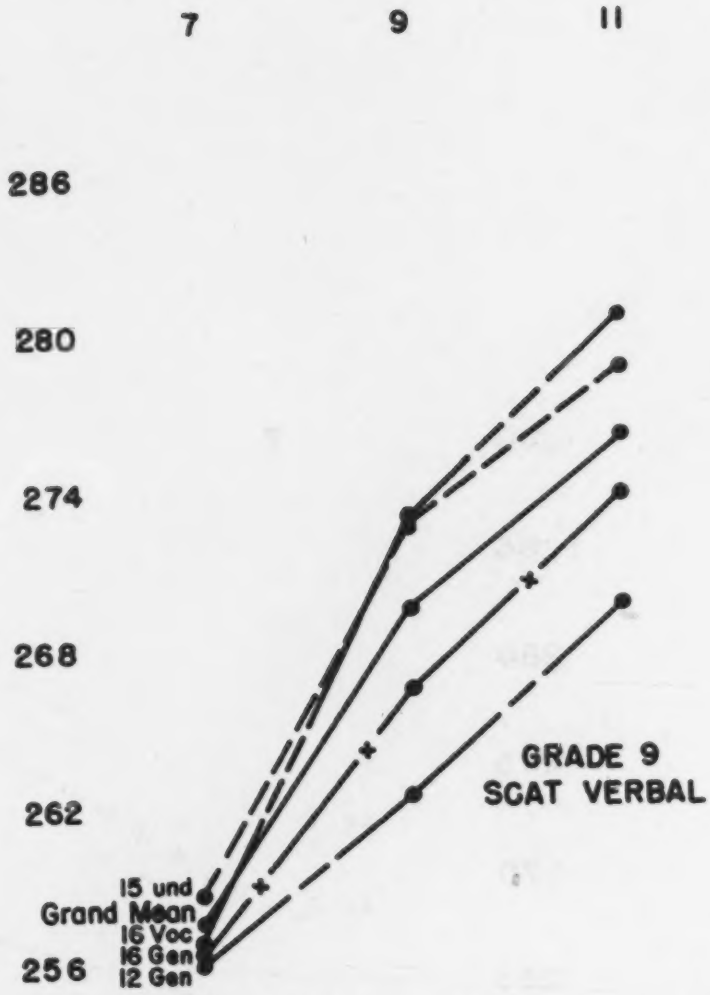


Figure 11. Plot of unadjusted STEP Science mean scores associated with Curriculum-Sex interaction.





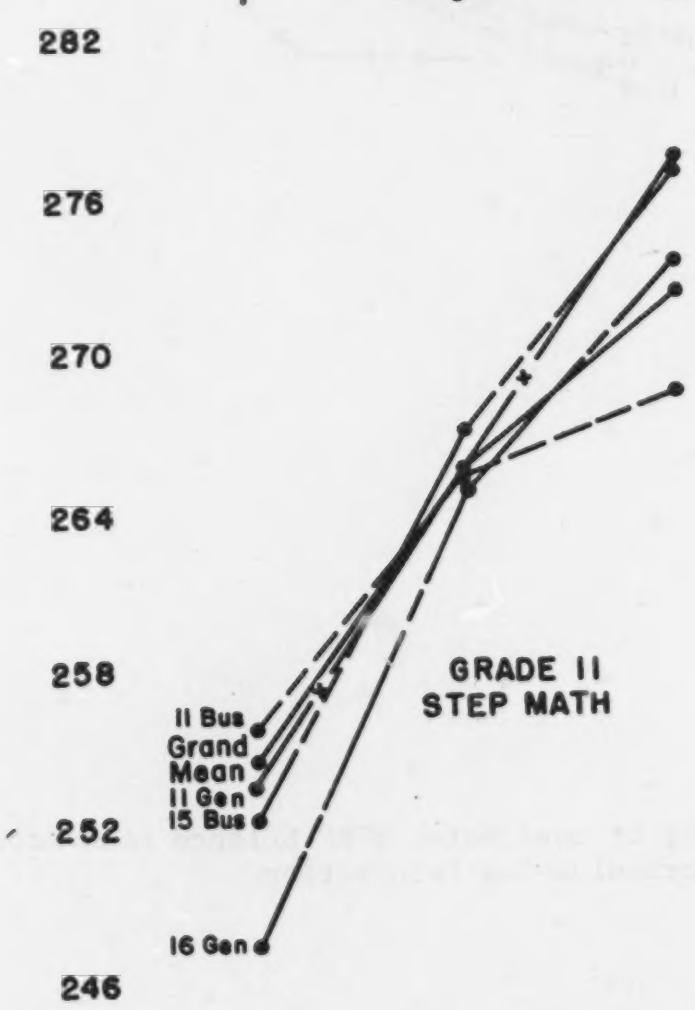


Figure 12. Plot of unadjusted mean scores associated with School-Curriculum interaction.

component coefficient of -.545 for SES and -.445 for SCAT Quantitative, this interaction effect is most pronounced among students who later attend four of the 18 schools (i.e., 15, 8, 11 and 12) and enroll in the business curriculum. At grade 9 three small but significant multivariate F ratios were found, and the first ($F = 1.693$, df 243/24, 368, $p < .001$) is associated with a discriminant function defined primarily by SCAT Verbal and STEP Reading. At grade 11 four significant discriminant functions were associated with the school-curriculum interaction, the first of which ($F = 1.768$, df 243/24,317, $p < .001$) is defined predominantly by the STEP Math variable. Figure 12 illustrates these achievement differences for those schools and curricula where this relationship is most extreme on the first discriminant function at grades 7 (SCAT Quantitative), 9 (SCAT Verbal) and 11 (STEP Math).

Performance and Curriculum Group Identification

The largest and most interesting F ratios that occurred in the analyses of these data were those associated with the curriculum, sex and school factors. In Tables 10, 11 and 12, results associated with the curriculum factor at grades 7, 9 and 11 are reported. In Table 10 it can be seen that at grade 7 two significant discriminant functions occurred on which the students can be distinguished. Figure 13 illustrates the relative distance among the 7th grade discriminant scores of those students who are later to enroll in the different curricular groups.

The coefficients of the principal components in Table 10 provide an indication of which variables can be used to construct a cautious interpretation. The first might be named general achievement, since all the coefficients except SES are large. The second would appear to be a positive science-negative SES dimension. In any case, the first multivariate F ratio suggests that at the beginning of grade 7, students who later enroll in academic curricular programs are to be distinguished from all of those who later enroll in non-academic programs in regard to overall achievement. For achievement in science and the quantitative area, the second significant multivariate F indicates that within the non-academic groups the vocational group is to be distinguished, particularly from the general group. Using mean scores on the STEP Science test, first to illustrate the difference between the academic and non-academic groups, and then to show the difference between the vocational and other non-academic groups, Figure 14 reports this information for all three grades. Apparently, students with lower SES scores who enroll in a vocational program are apt to do better on STEP Science than students who also have lower SES scores but who enroll in other non-academic programs.

The results in Table 11 suggest that when grade 7 data are included as covariates in the grade 9 analysis, the continuing significance of the curriculum factor indicates that some students (e.g., those later identified with the academic curriculum) are gaining at a faster rate than others between grades 7 and 9. Again, the first

Table 10

Results Associated with Curriculum Factor at Grade 7

Test of Roots	Multivariate F	df	p less than
1 through 4	28.218	36/10,693	.001
2 through 4	1.655	24/8,334	.023

	Univariate F Tests (df 4/2,861)		Principal Component Coefficients	
Variable	F	p less than	1	2
STEP Math	170.62	.001	.785	.291
STEP Science	147.47	.001	.728	.434
STEP Social Studies	165.66	.001	.775	-.038
STEP Reading	193.67	.001	.838	-.065
STEP Listening	160.77	.001	.763	-.132
STEP Writing	176.55	.001	.799	.196
SCAT Verbal	187.52	.001	.824	-.115
SCAT Quantitative	144.95	.001	.721	.336
SES	61.18	.001	.466	-.422

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Table 11

Results Associated with Curriculum Factor at Grade 9[a]

Test of Roots	Multivariate F	df	p less than
1 through 4	8.998	36/10,663	.001
2 through 4	3.104	24/8,311	.001
3 through 4	2.355	14/5,692	.003

	Univariate F Tests (df 4/2,853)		Principal Component Coefficients		
Variable	F	p less than	1	2	3
STEP Math	16.80	.001	.484	.216	.290
STEP Science	11.73	.001	.425	-.024	-.152
STEP Social Studies	12.46	.001	.395	-.211	.597
STEP Reading	15.74	.001	.447	-.433	.099
STEP Listening	13.12	.001	.383	.525	.391
STEP Writing	16.94	.001	.491	-.272	.332
SCAT Verbal	17.68	.001	.499	.368	-.172
SCAT Quantitative	25.06	.001	.619	-.092	-.257
SES	20.97	.001	.567	-.031	-.014

[a]Adjusted for grade 7 STEP and SCAT scores

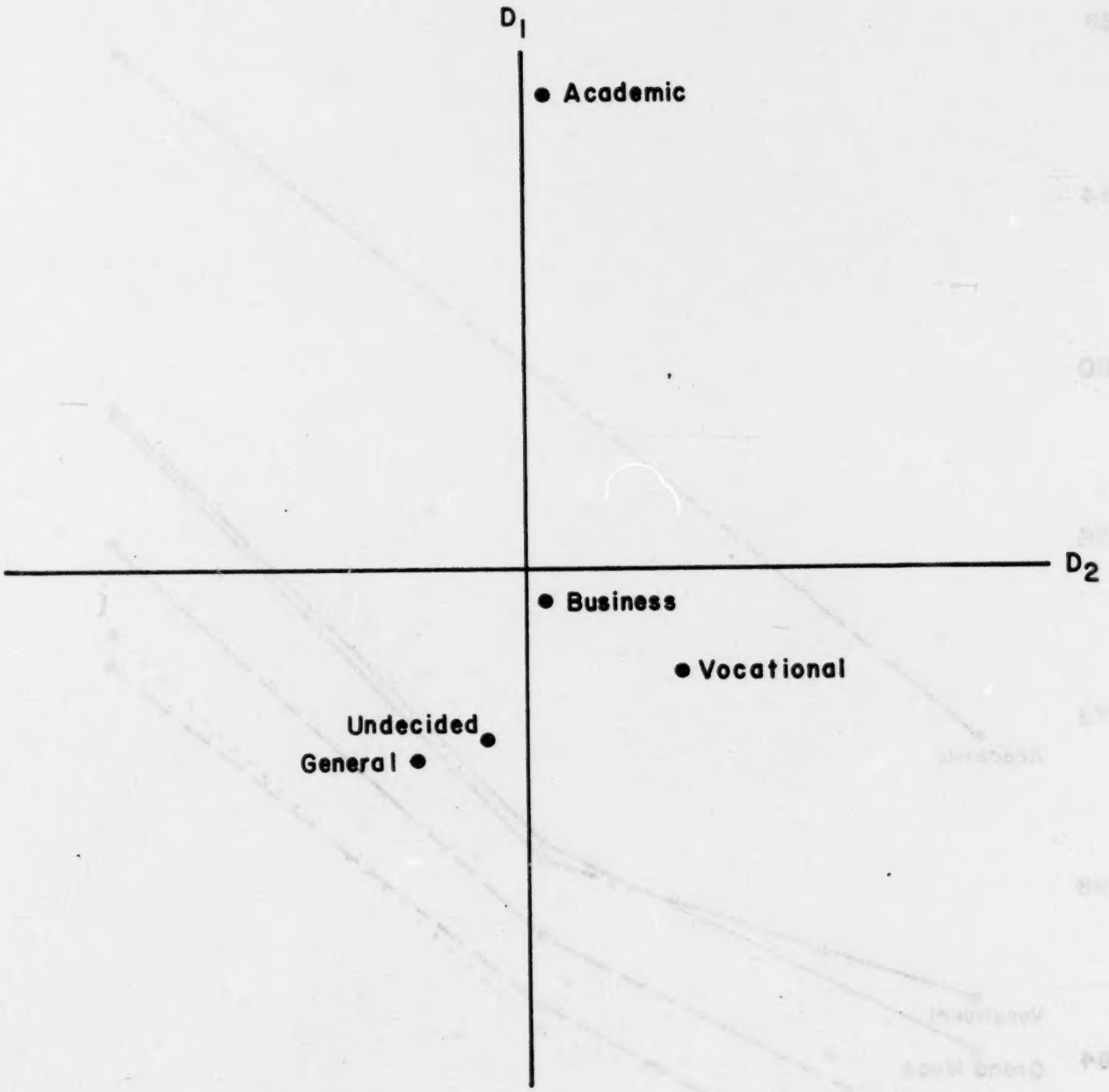
Table 12

Results Associated with Curriculum Factor at Grade 11[a]

Test of Roots	Multivariate F	df	p less than
1 through 4	5.530	36/10,633	.001

	Univariate F Tests (df 4/2,845)		Principal Component Coefficients
Variable	F	p less than	1
STEP Math	5.793	.001	.283
STEP Science	6.081	.001	.354
STEP Social Studies	9.644	.001	.473
STEP Reading	8.291	.001	.421
STEP Listening	5.556	.001	.331
STEP Writing	14.334	.001	.567
SCAT Verbal	9.193	.001	.460
SCAT Quantitative	7.636	.001	.405
SES	18.420	.001	.660

[a]Adjusted for grade 7 and 9 STEP and SCAT scores



D_1 = General Achievement and Ability

D_2 = Science Minus SES

Figure 13. Plot of discriminant scores for curriculum factor at grade 7.

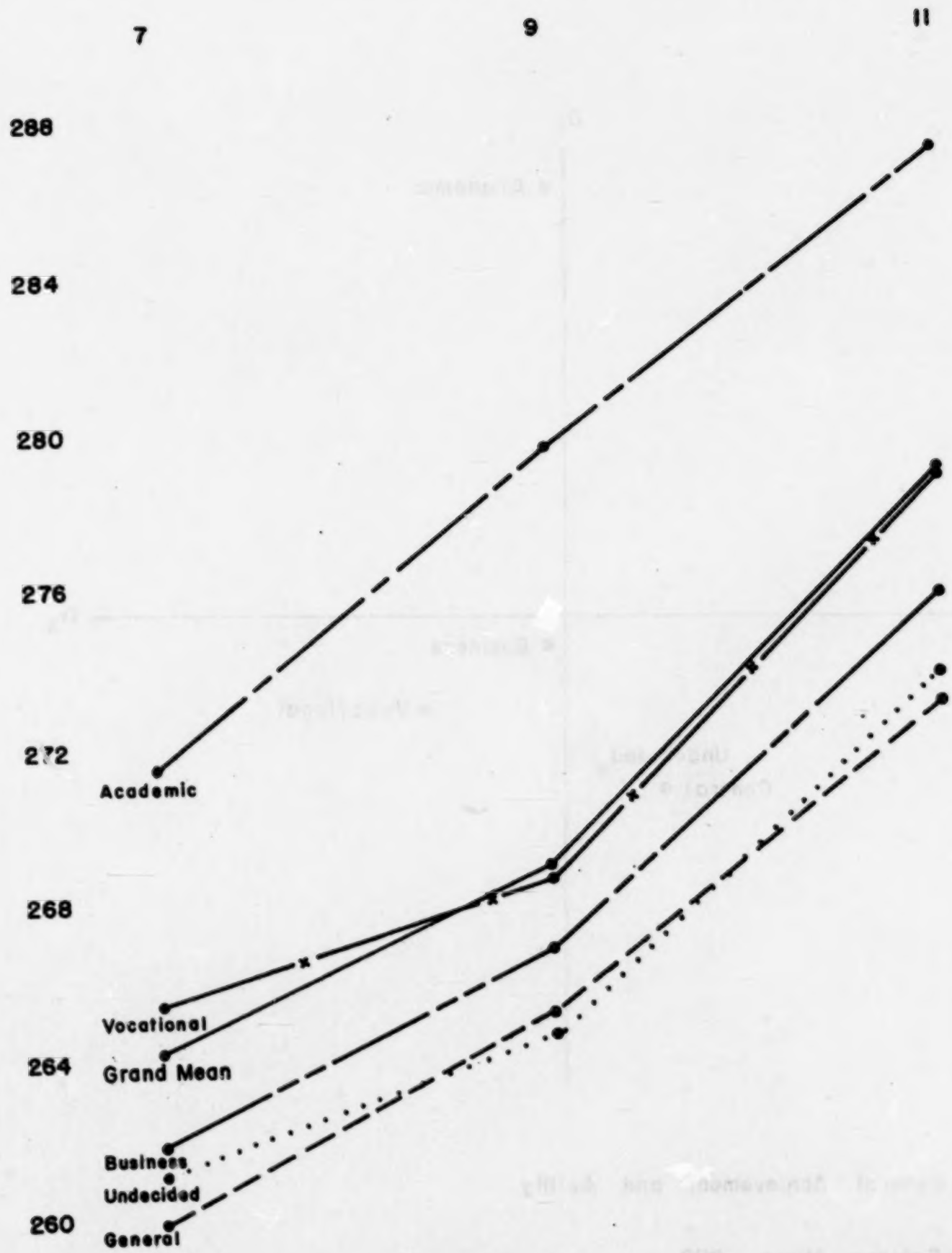


Figure 14. Plot of unadjusted STEP Science mean scores associated with curriculum factor.

discriminant function at grade 9 differentiates the academic from the non-academic groups, but this time in terms of what might be labeled achievement on SCAT Quantitative and SES, as well as general achievement. It can be stated elliptically that when scores on SES were controlled by covariance analysis in a rerun of the MANOVA, this discriminant function retained its significance ($F = 7.479$, df 32/10, 493, $p < .001$) and identity. The second and third discriminant functions both separate the vocational curriculum students from other non-academid groups. In the case of the second discriminant function in Table 11, the vocational group is clearly different from the business and undecided groups on what can be identified as a positive STEP Listening-negative STEP Writing dimension. The third discriminant function at grade 9 again separates out the vocational students, particularly from the general curriculum students, on a dimension apparently dominated by STEP Social Studies. In this case, the vocational group's performance on this variable is clearly the lowest. Figure 15 illustrates the discriminant scores for each curriculum group on each discriminant function at grade 9.

The significance of the curriculum factor at grade 11 (see Table 12) again indicates that some curriculum groups continue to increase at a more rapid rate than others. The discriminant function at grade 11 again separates the academic group from the non-academic groups, now on a dimension whose principal component coefficients for SES and STEP Writing are the largest. When SES was treated as a covariate in a re-analysis of these data, two significant functions occurred, and the first ($F = 3.920$, $p < .001$) still retained its identity as a dimension on which STEP Writing was predominant.

Performance and Sex Identification

Not surprisingly for data of these kinds, the multivariate F ratios associated with the sex factor were significant at grades 7, 9 and 11. Table 13 includes the MANOVA results associated with this factor at all three grades, and Figure 16 illustrates some variables on which the sexes are considerably different from each other.

At grade 7 the discriminant function (see Table 13) is dominated by a negative principal component coefficient of -.460 for STEP Writing. When grade 7 data are included as covariates in the MANOVA of grade 9 data, it can be seen in Table 13 that significant differences still occur between the sexes, and reference to Figure 16 would suggest that, on STEP Writing at least, this significance is due to the girls having gained more relative to the boys. While STEP Writing again has the highest principal component coefficient (-.629), STEP Reading also shows evidence of contributing to the differences in achievement between boys and girls at grade 9 (see Figure 16 and Table 13).

When the data are adjusted by covariance analysis for grades 7 and 9 data in the MANOVA of grade 11 data, significant differences between the sexes are still seen to occur. This is again especially true on the STEP Writing variable, and again in favor of the girls. Beginning about six points ahead of the boys at grade 7, the girls increase this

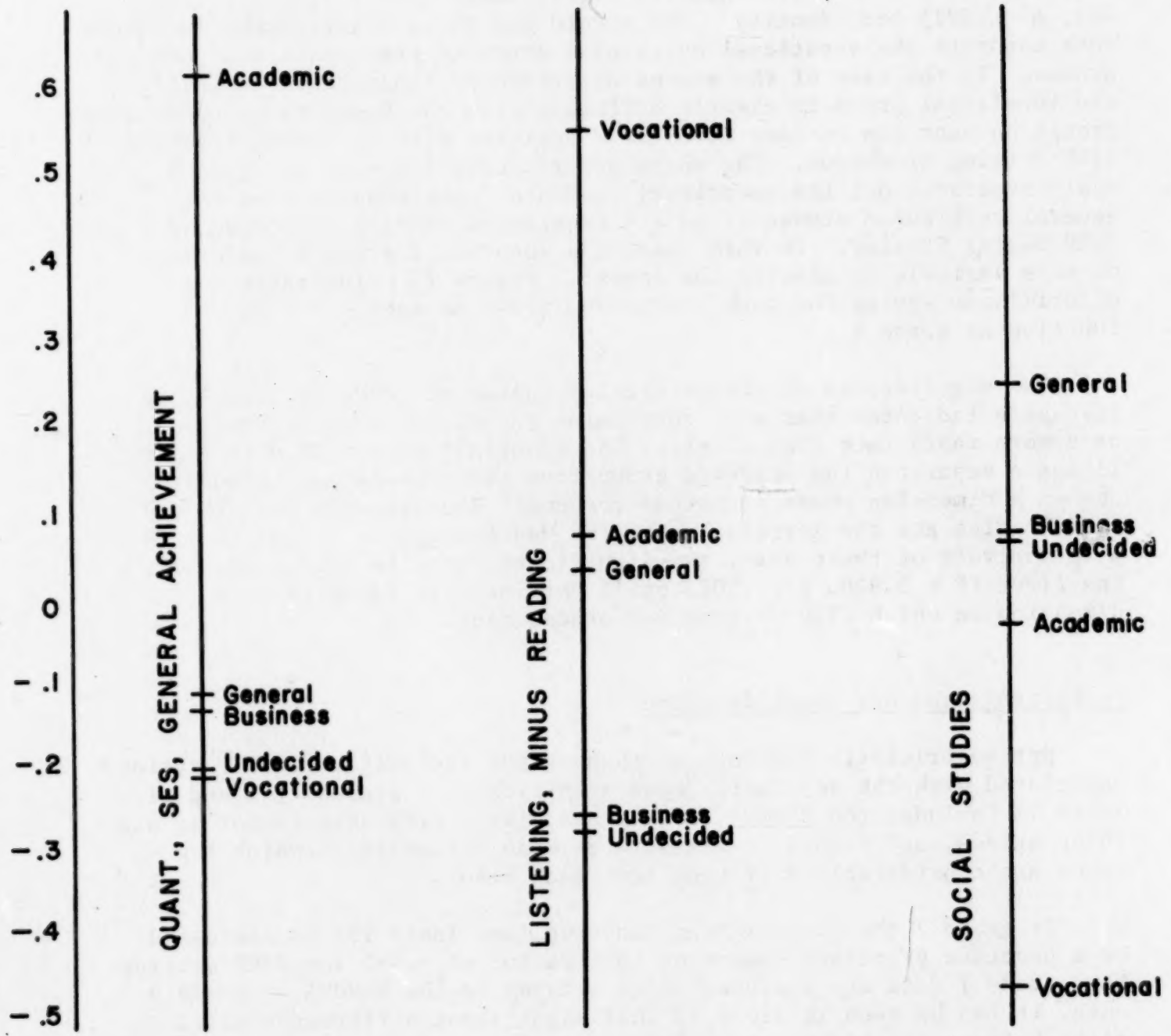


Figure 15. Plot of discriminant scores for curriculum factor at grade 9.

Table 13

Results Associated with Sex Factor
at Grades 7, 9[a] and 11[b]

Test of Roots	Multivariate F	df	p less than
Grade 7	94.776	9/2,853	.001
Grade 9	51.847	9/2,845	.001
Grade 11	46.005	9/2,837	.001

	Grade 7			Grade 9			Grade 11		
Variable	Univariate F (df 1/2,861)	p less than	Principal Components	Univariate F (df 1/2,853)	p less than	Principal Components	Univariate F (df 1/2,845)	p less than	Principal Components
STEP Math	31.336	.001	.191	38.727	.001	.288	107.737	.001	.509
STEP Science	68.227	.001	.282	35.832	.001	.277	69.245	.001	.408
STEP S.S.	2.280	.131	.052	12.834	.001	.166	38.900	.001	.306
STEP Reading	65.952	.001	-.278	82.016	.001	-.419	25.131	.001	-.246
STEP Listening	1.063	.303	.035	4.029	.045	-.093	11.420	.001	-.166
STEP Writing	180.764	.001	-.460	185.371	.001	-.629	93.054	.001	-.473
SCAT Verbal	.444	.505	-.023	5.195	.023	.105	.751	.386	.043
SCAT Quant.	.836	.361	.031	2.647	.104	.075	24.709	.001	.244
SES	7.719	.005	.095	3.108	.078	.081	1.133	.287	.059

[a]Adjusted for grade 7 data

[b]Adjusted for grade 7 and 9 data

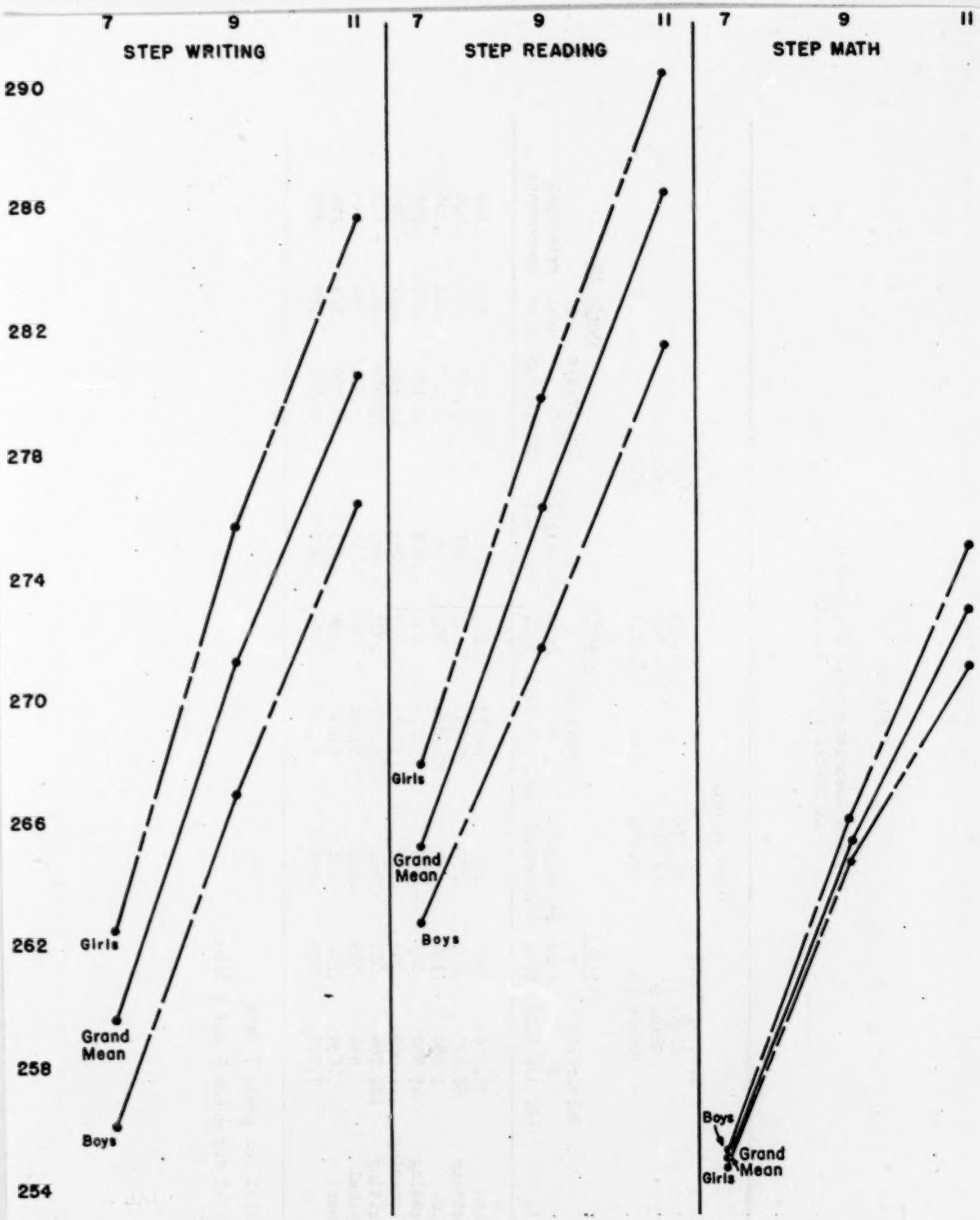


Figure 16. Plot of unadjusted mean scores associated with sex factor.

distance to nine points at grade 11. The boys, however, now appear to do significantly better than the girls on STEP Math ($p < .001$) and STEP Science ($p < .001$). The increasing differences between the sexes on STEP Math are illustrated in Figure 16.

Performance and Identification by School Attended

Table 14 contains the results of testing the significance of the differences associated with the high school factor on grade 7 data. From Table 14 it can be seen that there are seven significant discriminant functions, each of which defines a rank ordering at grade 7 for the groups of students who later attend one of the 18 high schools. Thus, at grade 7, the educational achievement, scholastic ability and SES of the students appear as presented in Figure 17 where the plots of the discriminant scores on the first seven dimensions are given tentative interpretation. That dimension at grade 7 which best discriminates (see D_1 in Figure 17) among students who later attend one of the 18 high schools appears to be a combination of SES and general achievement. (The reader will recall that after covarying scores on the SES variable a significant F ratio for the school factor still remained, and in that re-analysis the first discriminant function ($F = 9.534$, $p < .001$) could still be clearly identified as a general achievement dimension.)

The widest contrast in the distribution of the discriminant scores on the first dimension is between those from groups 9, 15 and 1 with higher SES scores, and those from groups 3 and 7 with lower SES scores. The second discriminant function, with large positive coefficients for reading and verbal achievement and a large negative coefficient for SES, appears to distinguish between groups which, at the high end, are generally lower on the SES variable, and those, at the lower end, which have higher SES scores.

When grade 7 STEP and SCAT scores are introduced as covariates in the MANOVA of grade 9 data, significant differences that were not predictable from knowledge of grade 7 results occurred, and are reported in Table 15. Seven discriminant functions were significant, and from the coefficients of these principal components tentative interpretations have been made, and the discriminant scores plotted in Figure 18. In Figure 18 it can be seen that the first dimension which discriminates among the groups at grade 9 seems best defined by STEP Listening in combination with SES and STEP Science (see Table 15). Again, schools 1, 15 and 9 can be rated at the high end on the first function. A second independent way of discriminating among these same groups at grade 9 still includes SES but now joins with a negative contribution from STEP Listening (see Table 15 and Figure 18). To illustrate the pattern of differences on STEP Listening, the means of those schools that were most dissimilar at grade 9 have been plotted from grades 7 to 11 in Figure 19. This has been done to highlight the fact that this variable, as a dimension of significant difference among the groups, has been noted at grades 7 and 9, and will again be noted at grade 11.

Table 14

Results Associated with High School
Factor at Grade 7

Test of Roots	F	df	p less than
1 through 9	14.127	153/22,862	.001
2 through 9	7.331	128/22,569	.001
3 through 9	4.995	105/22,227	.001
4 through 9	3.579	84/21,829	.001
5 through 9	2.451	65/21,362	.001
6 through 9	2.097	48/20,812	.001
7 through 9	1.845	33/20,163	.002

	Univariate F Tests (df 17/2,861)		Principal Component Coefficients						
Variable	F	p less than	1	2	3	4	5	6	7
STEP Math	39.18	.001	.634	.409	.165	.293	-.083	-.049	-.467
STEP Science	33.53	.001	.542	.541	.143	.359	.096	.171	.161
STEP Social Studies	35.27	.001	.551	.600	-.024	.037	.380	-.303	-.193
STEP Reading	39.21	.001	.555	.720	-.042	.185	.024	-.114	.154
STEP Listening	34.52	.001	.549	.431	.572	.085	.030	-.317	.042
STEP Writing	34.08	.001	.529	.633	-.092	.085	-.308	-.063	-.208
SCAT Verbal	39.79	.001	.600	.598	.077	-.075	-.218	-.396	.179
SCAT Quantitative	38.91	.001	.648	.118	-.162	.574	-.074	-.427	-.127
SES	55.00	.001	.779	-.323	-.069	-.438	.106	.254	.090

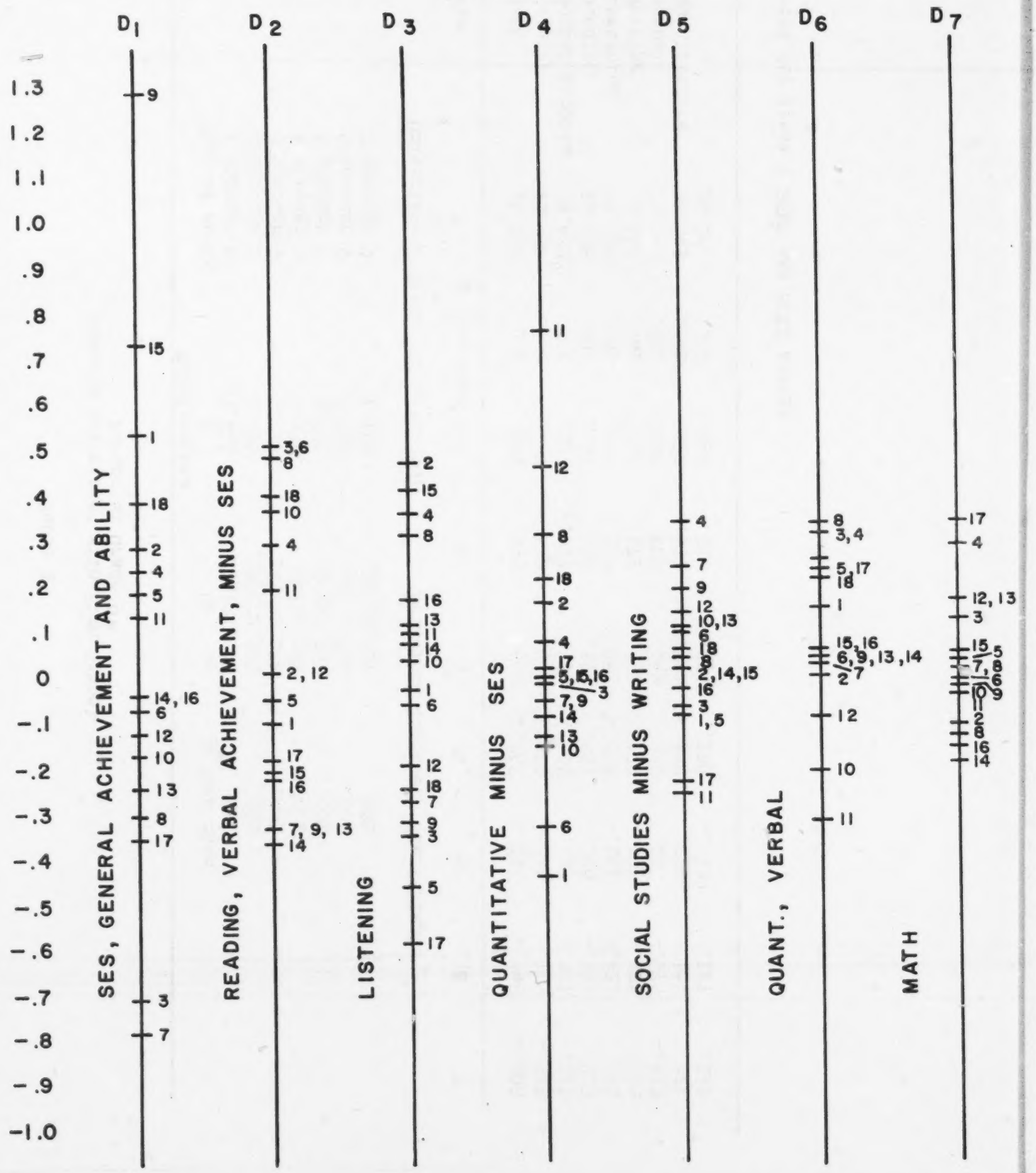


Figure 17. Plot of discriminant scores for high school factor at grade 7.

Table 15

Results Associated with High School Factor at Grade 9[a]

Test of Roots	Multivariate F	df	p less than
1 through 9	13.441	153/22,798	.001
2 through 9	8.400	128/22,505	.001
3 through 9	5.713	105/22,165	.001
4 through 9	4.338	84/21,768	.001
5 through 9	3.630	65/21,302	.001
6 through 9	2.866	48/20,754	.001
7 through 9	2.149	33/20,107	.001

	Univariate F Tests (df 17/2,853)		Principal Component Coefficients						
Variable	F	p less than	1	2	3	4	5	6	7
STEP Math	11.996	.001	.289	.099	.598	-.268	-.256	-.098	-.208
STEP Science	20.672	.001	.478	-.112	.504	.270	.347	.174	-.517
STEP Social Studies	9.478	.001	.227	-.067	.553	-.001	-.493	-.027	-.215
STEP Reading	10.395	.001	.224	.038	.592	.367	.198	-.345	.303
STEP Listening	40.425	.001	.699	-.528	.083	-.018	-.161	-.431	.046
STEP Writing	8.648	.001	.037	.172	.657	.239	-.135	-.428	.063
SCAT Verbal	7.562	.001	.190	.229	.143	-.340	.208	-.675	-.412
SCAT Quantitative	12.693	.001	.262	.037	.551	-.646	.254	.164	.321
SES	39.062	.001	.598	.714	-.255	.106	-.143	.127	.119

[a]Adjusted for grade 7 STEP and SCAT scores

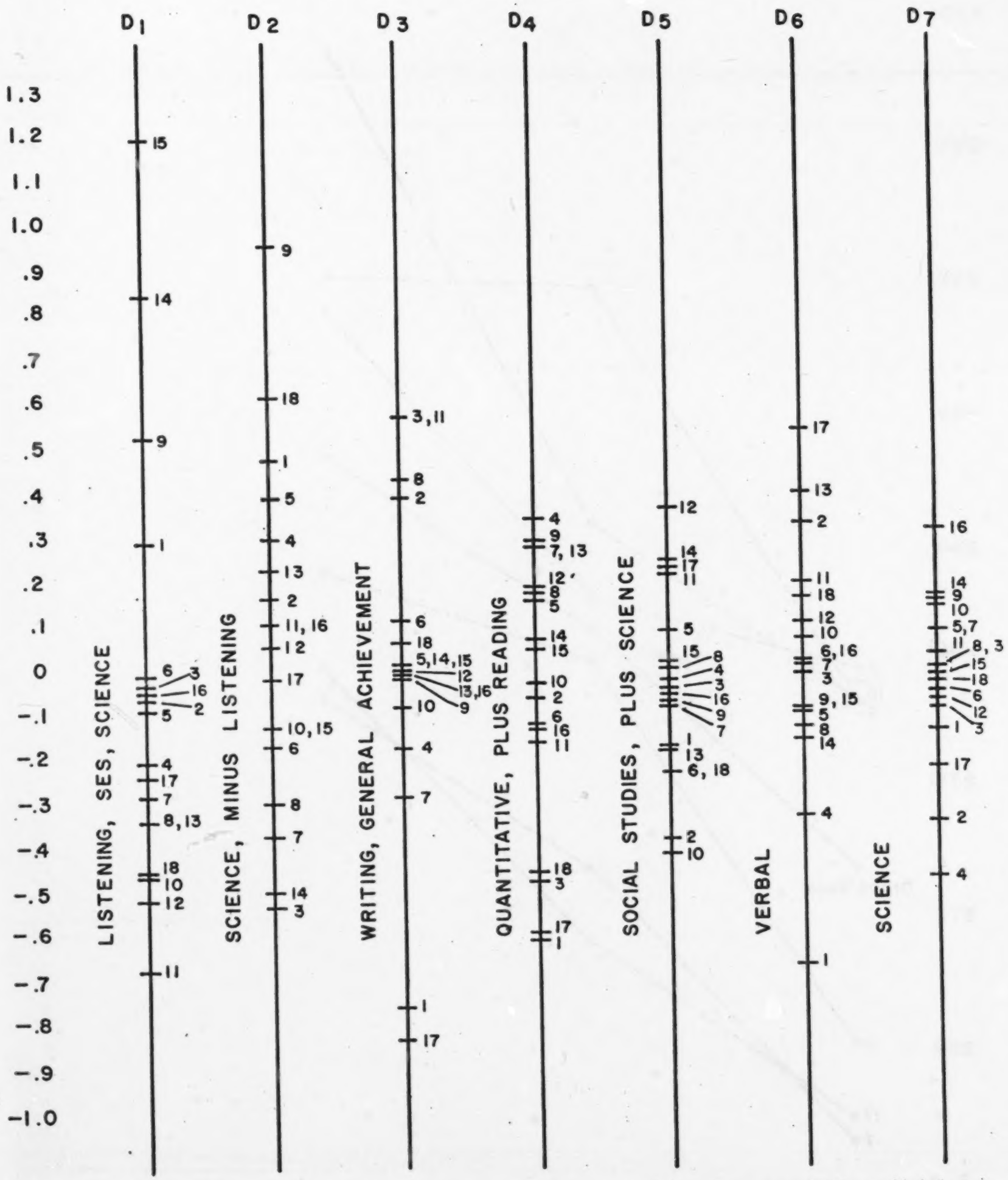


Figure 18. Plot of discriminant scores for high school factor at grade 9.

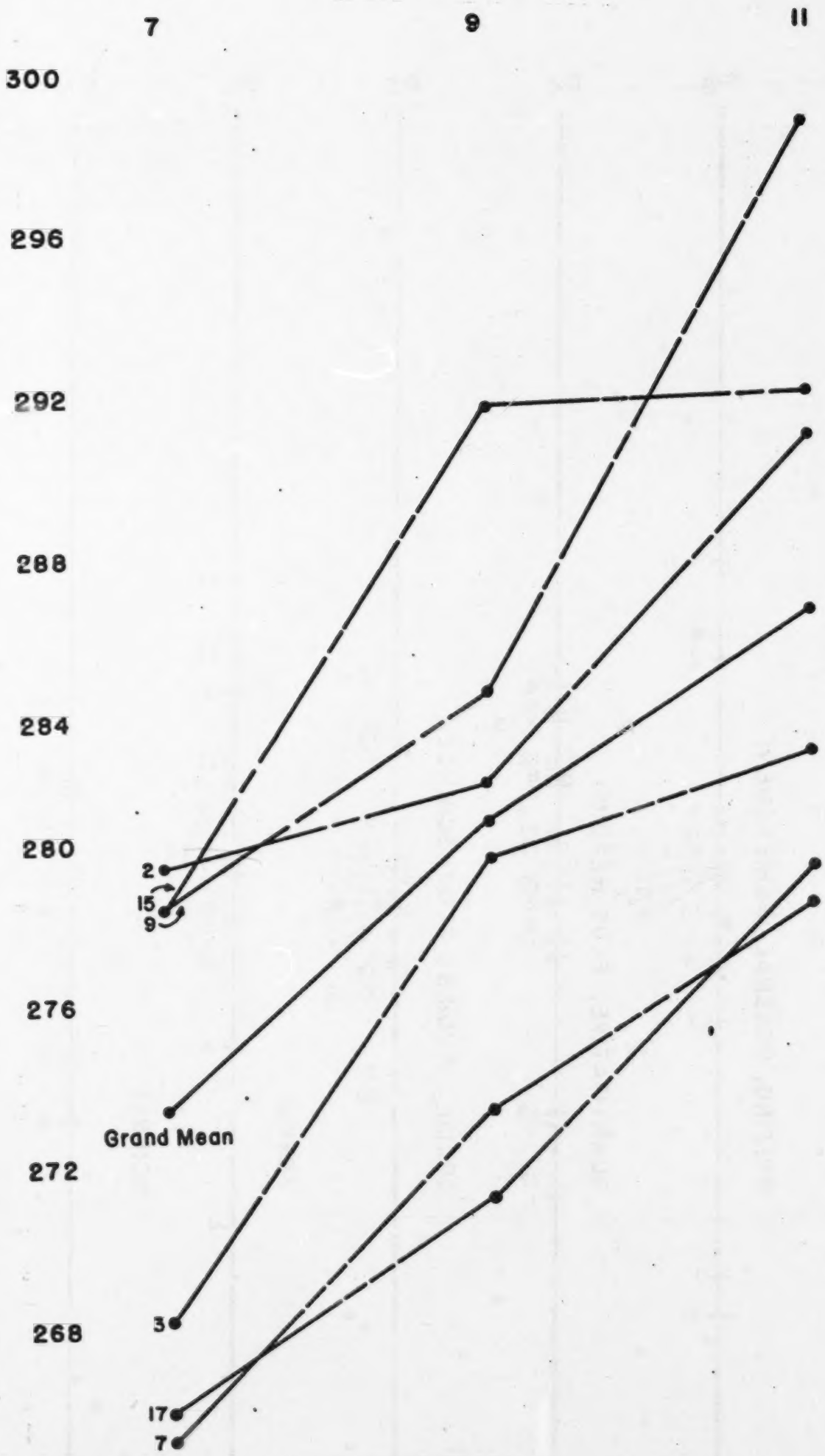


Figure 19. Plot of unadjusted STEP Listening mean scores associated with high school factor.

In Table 16 are reported the results of the MANOVA of grade 11 data adjusted for grades 7 and 9 scores. Six discriminant functions can be seen as significant. The first discriminant function has been identified here as a bipolar dimension of negative SES, positive STEP Science, followed next by a dimension identified as STEP Social Studies, Math and Science. The discriminant scores for each school group on the six significant functions at grade 11 are illustrated in Figure 20. Again, the presence of a large principal component coefficient for the STEP Listening variable is to be noted on the third discriminant function in Figure 20. In Figures 17, 18 and 20 it can be seen that it is not necessarily the same schools at any one grade which are the "outliers" on the STEP Listening dimension. The ability of this measure to contribute significantly to the ongoing discrimination among different groups is underscored.

Discussion

At grade 7 the educational achievement, scholastic ability and socioeconomic status of students who later enroll in different high school curricular programs discriminate among the students, and in doing so the nature of these attributes can be identified in a tentative way by noting the size of the principal component coefficients. That combination of variables which seems to discriminate best is a general achievement and ability dimension on which the students who later enroll in academic programs are clearly ahead of their non-academic peers (see Figure 13 and Table 15). The general achievement dimension persists through the analyses at each grade, as a means of distinguishing among the groups and describing their performance.

Less inclusive dimensions of educational achievement and background are revealed by the analyses of the curriculum factor. Differences among the non-academic students, particularly for the vocational group relative to the others, are apparent at grade 7 on a discriminant function identified by a large positive coefficient for STEP Science, and a large negative coefficient for SES (see Figure 13). The vocational students do well on STEP Science relative to the other non-academic groups, and this lead continues through grade 11. At grade 9, the students later identified with the vocational program now begin to exceed their non-academic peers on STEP Listening, and this is indicated by a new dimension defined by positive STEP Listening, negative STEP Reading (see Figure 15). STEP Social Studies also appears as a dimension of achievement at grade 9. Where the vocational group excels on STEP Listening it seems to do so at the expense of achievement in STEP Reading and Social Studies, in which they fall behind all other groups.

The educational achievement and background of the curriculum groups is first, and perhaps best, described and represented by general or overall achievement and ability in combination with SES. While the pattern of growth in achievement for the academic group appears evenly distributed across the areas covered by the STEP and SCAT tests, the same cannot be said for the non-academic groups. Their growth appears less general, and limited to such areas as STEP Science or STEP Social Studies.

Table 16

Results Associated with High School Factor at Grade 11[a]

Test of Roots	Multivariate F	df	p less than
1 through 9	13.666	153/22,734	.001
2 through 9	10.106	128/22,442	.001
3 through 9	7.259	105/22,103	.001
4 through 9	5.160	84/21,706	.001
5 through 9	3.130	65/21,242	.001
6 through 9	2.015	48/20,696	.001

	Univariate F Tests (df 17/2,845)		Principal Component Coefficients					
Variable	F	p less than	1	2	3	4	5	6
STEP Math	14.962	.001	.124	.546	-.254	-.437	.130	-.009
STEP Science	19.161	.001	.396	.533	-.064	-.261	.259	.300
STEP SS.	20.270	.001	.031	.735	-.002	.075	-.587	-.221
STEP Reading	8.695	.001	.141	.367	-.142	.258	-.376	.481
STEP Listening	22.562	.001	-.300	.481	.697	-.139	-.069	.389
STEP Writing	6.856	.001	-.148	.234	-.293	-.092	-.317	.668
SCAT Verbal	3.364	.001	-.032	.158	-.054	-.125	-.412	.397
SCAT Quant.	11.520	.001	-.150	.030	-.110	-.795	-.435	-.010
SES	35.961	.001	-.768	.275	-.392	.123	.310	-.029

[a]Adjusted for grade 7 and 9 STEP and SCAT scores

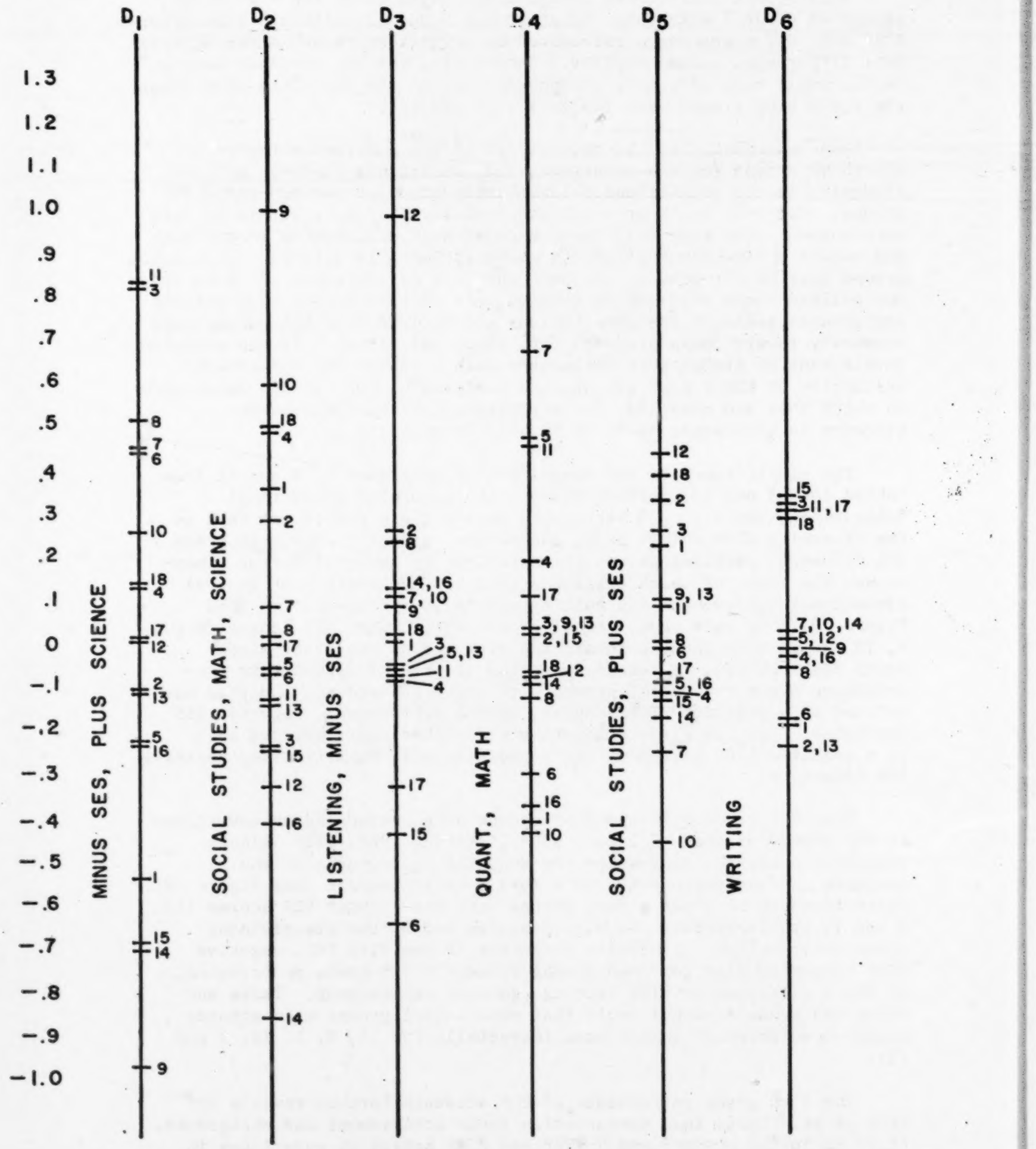


Figure 20. Plot of discriminant scores for high school factor at grade 11.

Achievement differences beyond those noted among the curriculum groups at grade 7 were observed at grades 9 and 11, although when prior STEP and SCAT scores were introduced as covariates these latter achievement differences became smaller. Conversely, the SES variable becomes increasingly more effective in contributing to the discrimination among the curriculum groups (see Tables 10, 11 and 12).

One implication of the main effect of the curriculum factor at all three grades for the vocational and educational guidance of such students, is the significantly lower achievement of the non-academic groups. Not only is their performance uniformly lower, but it is also more uneven. The practical importance of such differences in the rate and nature of intellectual growth among students in different curriculum groups lies in the need to re-think the kind of education it is we want non-college-bound students to receive, and whether or not such present performance reflects the expectations and attitudes of the educational community toward these students (cf. Rosenthal, 1966). If the vocational development of students is influenced both by their own and others' evaluation of their past educational achievement, and by the curriculum in which they are enrolled, the performance of the non-academic students in this study needs to be held in question.

The significance of the school factor at grades 7, 9 and 11 (see Tables 14, 15 and 16) further reveals the nature of educational achievement, ability, and background during these grades, as well as the diversity that exists among the several school groups. At grade 7 the students' performance was characterized by seven different dimensions, the first of which suggested that SES and overall or general educational achievement and ability were most representative (see Figure 17). In this case, school groups with higher SES scores (e.g., 9, 15 and 1) were located toward the high end of the discriminant score distribution. A second dimension at grade 7 appeared to discriminate among the school groups with lower SES scores, and this was defined as a positive STEP Reading, verbal achievement, negative SES dimension. Seventh grade students were further characterized both by a positive STEP Listening and a positive SCAT Quantitative, negative SES dimension.

When 7th grade STEP and SCAT scores were introduced as covariates in the MANOVA of grade 9 data a STEP Listening, SES, STEP Science dimension occurred, suggesting now that the performance of the students is best represented in a more specific manner (see Figure 18). Again students in those school groups with the highest SES scores (15, 9 and 1) are located at the high positive end of the discriminant score distribution. A bipolar dimension of positive SES, negative STEP Listening also represented the student's 9th grade performance, as did a dimension of STEP Writing, general achievement. These and other 9th grade findings imply that some school groups made greater gains in achievement than others (especially 15, 14, 9, 1, 18, 3 and 11).

The 11th grade performance of the students further reveals the kind of attributes that characterize their achievement and background. After including grades 7 and 9 STEP and SCAT scores as covariates in the grade 11 MANOVA, it became clear that a bipolar dimension

identified as positive SES vs. negative STEP Science is the attribute that best describes the students (see Figure 20). In doing so, it reverses a previous trend by locating school groups with lower SES scores at the top of the first discriminant score distribution, and this finding suggests that some of the lower SES school groups (e.g., 11, 3, 8, 7 and 6) make greater STEP Science gains between grades 9 and 11 than do some of the higher SES school groups (e.g., 9, 14, 15 and 1). A second dimension at grade 11 further specifies the nature of achievement which characterizes these students. A STEP Social Studies, Math and Science dimension locates those school groups (e.g., 9, 10, 18 and 4) who appear to have made greater gains (i.e., in STEP Social Studies) from grades 9 to 11 than other school groups (e.g., 14, 16, 12, 15 and 3). A positive STEP Listening, negative SES dimension again adds to the description of this group's educational achievement at grade 11 and implies that some lower SES school groups (e.g., particularly 12) generally make greater gains in STEP Listening than do the higher SES groups (see schools 6 and 15 on D_3 in Figure 20).

Those attributes which appear, then, to best characterize this sample of students at each grade are, until grade 11, those on which generally higher SES groups do better. In general, lower SES school groups seem to perform at a higher level of achievement on more specific than general attributes, and while a few higher SES schools (e.g., 1, 9 and 15) are always ahead in terms of mean score, some lower SES schools (e.g., 11, 7 and 3) make greater gains in achievement over time. The educational achievement of the various school groups does appear to change, as shown by these data, from the general to the more specific although, in absolute terms, the differences among school groups on any one dimension get progressively smaller from grades 7 to 11. Even so, the differences that remain among the groups at grade 11 are still of practical educational importance, especially in STEP Listening, Social Studies, Science and Math.

The way in which the school itself might contribute to the differences noted in this research was not a focus of the investigation. Yet, the pattern of performance of the different school groups at grade 11 argues for the mediating influence of the school upon the vocational and intellectual development of students. How to obtain impartial understanding of what the school does to and for students has been presented in an evaluative scheme by Dyer, Linn and Patton (1968) and the present study underscores the need to obtain such understanding.

Summary and Conclusion

A multivariate analysis of variance (MANOVA) was performed on the STEP, SCAT and socioeconomic (SES) scores of 2,952 Growth Study subjects at grades 7, 9 and 11. The subjects were grouped using grade 11 information according to 5 curricula, 2 sexes and 18 high schools so that the MANOVA of grades 7, 9 and 11 data was accomplished using these factors as design parameters.

The findings indicate that at each grade the school, curriculum and sex factors were each associated with significant multivariate F ratios. As early as grade 7, meaningful differences in the performance and background of these subjects were apparent. For example, at grade 7 the performance of students who later enrolled in an academic curriculum was seen to be considerably higher than that of all non-academic groups, and was characterized primarily by a general achievement discriminant function. Among the non-academic groups, the vocational curriculum students were distinguished from their other non-academic peers in terms of performance on STEP Science and low SES, a trend that continued through grade 11. In general, it was found that the academic curricular group exhibited evenly distributed achievement across the areas covered by the STEP and SCAT tests from grades 7 to 11. The on-going achievement of the non-academic groups appeared less uniform with higher achievement noted on STEP Science and Social Studies.

The school factor was observed to distinguish significantly among the school groups at grade 7 in seven different ways. The first function was, however, a general achievement-SES dimension. The first discriminant function at grade 9 was interpreted as a STEP Listening--SES--STEP Science dimension where schools with high SES scores were ranked at the high positive end of the first discriminant score distribution. A more specific performance dimension characterized the first discriminant function at grade 9 and was given tentative interpretation as STEP Listening--SES--STEP Science. At grade 11 a positive SES, negative STEP Science dimension was the first discriminant function.

The attributes which appeared to best describe the sample of students at each grade were, until grade 11, those on which higher SES groups did better. However, some lower SES groups made greater achievement gains over time than did higher SES groups. The differences that wer found to remain among school groups at grade 11 are of practical educational importance, especially in the achievement areas covered by STEP Listening, Social Studies, Science and Math.

Chapter 7

The School and Community as Factors in Student Achievement

Patricia L. Casserly and William E. Coffman[1]

A complex pluralistic society such as ours, founded on democratic principles and recognizing the importance of each individual in the society, assigns a myriad of formidable functions to its public schools. The school is expected to concern itself with the development of intellectual skills and with the transmission of knowledge. That is taken for granted. In addition, it is called upon to assume a variety of functions which in a simpler society might be assumed by other agencies. Since the late 1960's, for example, it has been expected to compensate for "injustices" experienced by children before they begin their formal education, cultural inequalities experienced because of limitations of family background, community disorganization, or economic deprivations. To a considerable extent, the school is asked to assume responsibility for the broad intellectual and personal development of individuals, not simply for teaching the traditional organized subject matter. The extent of the expectation is illustrated in the following set of goals drawn up by the State Board of Education of the Commonwealth of Pennsylvania (Educational Testing Service, 1965, pp. 10-13):

I. To help every child acquire the greatest possible understanding of himself and an appreciation of his worthiness as a member of society.

II. To help every child acquire understanding and appreciation of persons belonging to social, cultural, and ethnic groups different from his own.

III. To help every child acquire to the fullest extent possible for him, mastery of the basic skills in the use of words and numbers.

IV. To help every child acquire a positive attitude toward school and toward the learning process.

V. To help every child acquire the habits and attitudes associated with responsible citizenship.

VI. To help every child acquire good health habits and an understanding of the conditions necessary for the maintenance of physical and emotional well-being.

VII. To give every child opportunity and encouragement to be creative in one or more fields of endeavor.

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[1]Now at the University of Iowa.

VIII. To help every child understand the opportunities open to him for preparing himself for a productive life and to enable him to take full advantage of these opportunities.

IX. To help every child understand and appreciate as much as he can of human achievement in the natural sciences, the social sciences, the humanities, and the arts.

X. To help every child prepare for a world of rapid change and unforeseeable demands in which continuing education throughout his adult life should be a normal expectation.

In working toward such a set of goals, the school must necessarily function within the framework of the larger society. Formal education is only one of the many factors that contribute to the student's development. The child does not stop learning when he passes through the schoolhouse doors in the afternoon; to a considerable extent his motivation for pursuing school work is determined by what happens to him outside of the school. Furthermore, a variety of forces in the community will affect the ways in which each school defines "worthiness" or "well being" or "creativity" or other outcomes toward which the school is working. It is probably impossible to determine the effectiveness of any single school or school system apart from a consideration of the community of which it is a part.

There have been many attempts to assess the effectiveness of particular educational programs. In most cases, however, these attempts have focused on academic skills and knowledge. These have proved relatively easy to assess, while outcomes such as the development of creativity, personal and social adjustment, and the like have proved difficult to assess. The typical study has compared the performance of students at the end of a period of schooling on one or more achievement tests, after taking into account differences in intellectual abilities at the beginning of the period. It appears that after intellectual input is statistically controlled, some schools appear more successful than others in enhancing cognitive growth (French, 1959; also see Chapter 6); however, the studies do not enable one to understand why. Is the explanation to be found in what goes on inside the schools? Or are there factors in the community or the home that contribute more than does the school to achievements demonstrated by students?

Interest in questions such as these led ETS to undertake the Growth Study. Analyses of the data, given in Chapter 5, indicate that there are significant differences in patterns of test scores for the different schools and for groups of students enrolled in different curricula. The study reported in this chapter grew out of a recognition that more needed to be learned about the characteristics of the educational programs in the various schools than could be inferred from the responses to test and questionnaire items. Of particular interest was information about the complex

pattern of school and community factors as they affected the students who were not actively enrolled in college preparatory programs. To what extent could different community and school climates be identified? If there were different climates, how were they related to the achievement and adjustment of students, particularly of those students who were likely to be entering the adult world of work directly from the secondary school?

During the winter and spring of 1968 several members of the ETS research staff visited 16 schools across the nation. Observation and focused interviews were used in an attempt to provide a more complete picture of each school's educational program in the context of the total school-community context. We did not presume, through these visits alone, to answer questions about the effects of programs, schools and communities. Rather, the expectation was that hypotheses could be developed that would enable a better understanding of previous analyses and, of greater significance, could provide a framwork for future analyses that might be used to test these hypotheses.

We assumed throughout that programs for "nurturing those abilities, attitudes and habits of thought and action which make for responsible citizenship, vocational effectiveness and maximum personal development" may differ greatly from school to school, or even within schools, and still be highly effective (Peterson, 1968, Chapter I). Thus, we weren't looking for the ideal program. Rather, we were looking for patterns of activity inside and outside of school that seemed to students and to their teachers and counselors to be valuable in fostering both vocational maturity and academic progress.

The purpose of this paper is to present in some detail our methods of collecting data, and then go on to a description of three of the secondary schools we visited. Let's call them Richton, Junction City, and Plainsville, although those are not their actual names. They represent three variations of the triadic relationship between students, the school, and the community; variations that we also observed in a number of other communities we visited, and that seem to warrant particular attention.

It should be understood that although a few of the visits were made to schools located in large urban centers, no attempt has been made to include data from those visits in this analysis. We deliberately limited this analysis and interpretation to the data from schools located in small, relatively self-contained communities with populations of six to 12 thousand. Some of our observations and hypotheses may apply to schools in large urban centers; however, we recognize that such schools face a whole complex of problems not found in the schools described in this report.

The Interview Data

In the fall of 1967 a detailed interview schedule was developed and pretested on representatives of the Growth Study schools who attended a meeting in Princeton. The first section of this schedule contained questions designed to elicit detailed demographic information about the communities in which the schools were situated. Section II dealt with the curricular and social structure of the school, e.g., What is the school's experience and policy on potential dropouts? On tracking or homogeneous grouping? Do non-college-bound students share classes with those in the academic curriculum? How much social segregation is there between students in the various curricula? Section II was concerned with counseling procedures for students in technical and vocational programs. We were interested in discovering at what times curricular choices were made, and on what basis, and how flexible these choices were once a student was enrolled in a program.

During the pilot interviews the school representatives were encouraged to tell us what made their schools unique, e.g., Were there special problems in the school or community of which we ought to be aware? Were there special facilities or programs within the school of which they were particularly proud? In short, the representatives were asked to tell us what they would like the researchers to be particularly aware of during their visits to the schools.

The interview schedule in its final form can be found as Appendix . Although each visit to a school lasted only a day or a day and a half, most interviewers managed to talk with a number of different people who might be expected to provide different perspectives: the school principal, and sometimes the superintendent, guidance counselors, teachers representing both vocational-technical and academic curricula, and students. Each visitor talked with six different students who had been chosen at random from lists available at ETS, not by officials of the school. Most of them were enrolled in non-academic curricula. In addition, the visitors inspected shops and laboratories, and some of them were able to sit in on a class or two and to hold group interviews in those classes.

Although the visits were much too short to give us anything but "snapshots" of particular schools on particular days--rather than well-constructed documentaries over time--we were able to identify some problems that seem common to all schools and thus are able to report on a variety of solutions to these problems and to make tentative hypotheses about the strengths and weaknesses of various treatments of students who are engaged in one form or another of non-academic training.

The Three Schools and Communities

Richton. The school in Richton has an enrollment of approximately 700 students in a modern, well-equipped building. There are

unusually well-equipped laboratories for both academic and vocational courses; for example an electronic shop, equipped with 10 oscilloscopes. The staff of more than 50 teachers and three guidance counselors is highly trained. More than half have advanced training beyond the master's degree. The school is located in a stable, middle-income, suburban and semirural community of 10,000 situated less than 50 miles from a large industrial and cultural center. The school population is predominantly third generation Americans of European extraction; only about 10% are descendants of the original settlers of the area. Most of the parents of the students own small businesses and shops, or work at skilled occupations within the community. Only a small percentage, including some professionals and writers, commute to the metropolis. There are very few unemployed adults within the community, and many openings exist at all occupational levels within easy commuting distance.

As taxpayers, the residents of the community are generous with funds for the school, and in turn expect the school to take full responsibility for the education of their children. They interfere not at all with the running of the school--do not participate in PTA or come to special school programs such as "career days" or "plan for college nights." Furthermore, they appear to do little at home to increase the motivation of their children; that, too, they expect the school to take care of.

This attitude of "we provide the money, you educate the kids" has some advantages for the innovative staff and administration. They have been able to run rather sophisticated programs--in the exploration of drug abuses and in sex education, "T-groups" for underachievers and the gifted, and mock political conventions--with no complaints from parents or community leaders. They are also innovative in such programs as a splendid interdisciplinary humanities course of the non-college-bound, who are segregated in academic as well as non-academic work in this school. According to the program coordinator, the course is one which teaches

> man's sense of value and senses of the value of American culture.... As we explored the ramification of the problem we became convinced that the great need for such a course was not that of the college-preparatory students (to whom most humanities courses seem to be directed) but that of the business and terminal students--those whose formal education ends with high school. Our conclusion was that, for these students, the closest they come to a liberal arts education is what we offer them.
>
> We decided to limit our program to a close analysis of three of the crucial issues in American culture--prejudice, morality and the individual in society....With each issue, the approach was the same. How did we get here? What is happening today? And what do we do about it?

Most parents in Richton had been young adults during the depression. Those who were college graduates had struggled to find and keep jobs while attending college at night on a part-time basis, often for five to seven years in order to earn their degrees. Immediately afterwards, many served in the Armed Forces during World War II. The depression and the war effectively postponed marriage. And the creation of children was postponed until debts were paid off and one was established in business.

According to several teachers and administrators in the school, these college educated parents who would be expected to be ambitious for their children want to spare them "the struggle that we faced" either in school or later years. The children are encouraged by their parents to go to college--but they are not pushed to try for the most selective institution they might hope to attend. In most parents' minds a junior college or the state university is just as acceptable as the Seven Sisters or the Ivy League, and a lot less expensive. On the other hand, parents are generous with allowances, cars, and other of the material benefits of today's affluent society. The young people are denied little while they are in high school.

Richton school sends 72% of its students on to some type of post-secondary education: 27% to four-year colleges, 22% to two-year colleges, 2% to nursing schools, and 21% to noncollege educational institutions.

During the high school years the true dropout rate (the percentage of students lost to any further education) is only 5%. This figure might be larger were it not for two factors: the strenuous efforts of the guidance staff and simple inertia on the part of disinterested students. One student expressed it this way, "I was suspended for a day and my mother said 'Why bother to go back? You don't have to.' But I decided I might as well sit around here (in school) with my friends than home alone without them." (Notice this student said nothing about getting a job. Indeed, during the rest of the interview she stated clearly that she had no plans for the immediate future beyond having a good time.) As a group, the students seem content to take things easy, enjoying the affluence provided by prosperous parents.

Junction City. If many of the students in Richton are oriented toward conspicuous consumption, many of the students enrolled in the Junction City school are plagued by conspicuous poverty. The school of approximately 800 is situated in a once prosperous, self-contained community of approximately 8,000. Thirty-five years ago the small farms surrounding the community were economically viable for individual families whose dreams were limited by present day standards. Gradually, aspirations and economic realities changed, and large corporations bought up and consolidated the holdings of individual farmers. The town is now surrounded by large farms owned by absentee landlords. They introduced new crops to the land which required constant and reliable irrigation (an expensive undertaking). The yield is now harvested mechanically.

Thus the small farmers have been gradually pushed from their land and the unskilled or semiskilled laborers on whom they used to depend are no longer needed. For a while some of these workers could find employment in local businesses or in a plant operated by the railroad that served the town. But now only one freight stops each day. The welfare rolls have increased steadily over the last 20 years as the railroad has shifted its business to a nearby city nearly 10 times as large.

One-fourth of the population is of Mexican descent. The children of Mexican extraction now in school are often the third generation of their group to live in this town and often the second generation to be supported by welfare that, according to one informant, is "sadly, a socially acceptable way of life." The Indian and Spanish influences in the Mexican families are quite strong. To quote one of the school officials: "With the Indian's attachment to the place of his birth and the Spanish tradition of guarding unmarried daughters, it is difficult to motivate young people, particularly girls, to move out of the community to where they'd have a chance."

Because home owners, businessmen, and tradesmen are also hurt by the shutdown of the railroad's activities, the community is unwilling or unable to maintain--much less increase--its support of the schools. Teachers start at the minimum salary allowed by the state, and there is very little difference between the minimum and maximum salaries for teachers. The maximum salary attainable for a principal is under nine thousand dollars a year, and all teachers, we were informed, have second jobs.

Yet someone in the recent past, when the community was not so economically depressed, had vision. The high school is of unusual modern design--a series of white-roofed units clustered around a central core that gives the illusion of circus tents spread out on the plain. The classrooms in each unit are pie-shaped and are arranged around a special departmental library. For example, all mathematics classes are held in one unit, all English classes in another, all business classes in a third. The libraries for each subject in turn surround the appropriate teachers' offices, the rationale being that this arrangement allows a student studying in the library to get help in the subject he is studying easily and quickly. (In addition there is a main library and the usual facilities for large groups of students.)

Of special pride to the administration is the TV equipment that can relay programs from national networks, record activities in one classroom and simultaneously relay them to other classrooms, or transmit several different "canned" programs to the appropriate classrooms at the same time. Unfortunately, there is no money to hire the technician necessary to make use of this sophisticated hardware. Nor is there money for an adequate gymnasium. Physical educational classes are usually held outside, throughout the year. Fortunately, some shops and the home economics facilities were well equipped before the school ran out of funds.

The recent establishment of a junior college in the community financed by the state has proved a mixed blessing. On the one hand, it has brought a new source of income to tradesmen; on the other, it has almost exhausted the opportunities for high school students to enter the cooperative program in distributive education. College students, many from outside the community, now have the jobs that were once open to needy secondary school students. In 1968 only 15 part-time jobs were available to high-schoolers and the guidance counselor needed 75 jobs to meet the needs of his charges--both for financial and experiential reasons. "Our biggest job is to educate these people to leave the community. We can give the skills but they need the concrete experience so that they can make a go of it--to learn for themselves that they are worthwhile and that the struggle is worthwhile."

Although 61% of the graduates begin some kind of postsecondary school training, very few attend four-year colleges and aspire to a college degree. A number go to the junior college down the street; many enroll in the business curriculum, which is "far below what we offer here." Some of the high school seniors plead they can't afford even the local junior college. The guidance counselor says there are enough job opportunities at the college to enable all these students to go and pay their way. "Even so, come fall," he told us "there will be a few that I will take by the hand and march down there on foot to make sure they register." Overcoming apathy and low self-esteem is a constant battle. The secretarial skills of 20 girls have market value. Last year Federal Agencies in Washington offered them jobs. Not one accepted. "Usually I have more luck," he mused, "but you have to convince the parents to let them go."

Informants at both the Richton and Junction City schools were concerned about many of their students' depressed aspirations and lack of motivation, but for quite different reasons. In Richton, these insufficiencies seemed to be attributable in part to the fact that home and community were oriented toward enjoyment of that measure of affluence that hard-working parents who had struggled through the depression were able--and almost compulsively driven--to give to their children. In Junction City, school personnel were battling the tendency to "give up" which grows out of poverty. The "snapshot" of Plainsville school and the community in which it is situated is quite different.

Plainsville. The nearly 500 students enrolled in the Plainsville school live in a stable community of 6,000 surrounded by prosperous and locally owned ranches. Within the community are a small chemical plant, a feed mill, and a contracting business as well as the usual businesses necessary to serve an area of more than 400 square miles--food, drug, clothing and hardware stores, lawyers' and physicians' offices, restaurants and gas stations, churches and a mortician. A few members of the community are employed at a military base nearby--but the other salaried workers are employed within the community. The nearest urban and industrial center is over 50 miles away.

The people of Plainsville are 89% native-born white Americans, 1% black Americans, and 10% Mexican Americans. Our informants were not aware of any unemployment in the community nor any unemployables. Nor was anyone known to be on welfare. The community is achievement-oriented. Although over 80% of the ranchers are classified by school officials as "upper-middle-class," their wealth is "hidden-wealth." No conspicuous consumption or indulgence of adolescent "material needs" here! Rather, a deep concern for their children's education, their growth toward maturity, and, of course, involvement in and support of the schools. Whatever "the kiddoes need" at school is often supplied by one member of the community or another without waiting for a bond issue and the next election. This is the result of a happy blending of community concern and a dynamic, dedicated school administration.

The Plainsville school is qualified by the state as an area vocational school and offers six technical and vocational programs in addition to the purely academic one. Indeed, 34% of the students are officially enrolled in non-academic programs and 65% of the students take some technical and vocational courses. Yet 68% of the graduating class goes on to higher education, half to junior colleges (with many later going on for baccalaureate degrees) and half to four-year institutions of higher learning.

Discussion. These three descriptions do not exhaust the possible types of--and relationships between--communities, schools, and students. Nor are they in any sense perfect types to which others may be related. They are, however, three distinctively different examples of the relationships between students, community, and school. It is hard to escape the conclusion that the nature and interplay of these elements affect the students' self-images and the way they view their educational experiences in relation to their future lives. Any realistic evaluations of their schools' programs will have to take this broader environment into proper account. There is no more reason to believe in the "perfect school" than in the "beautiful line." Both depend on how they fit the larger scale.

In Richton, for instance, three guidance counselors for 700 students at a school, richly supported--yet in effect ignored--by the community, are trying to help rather pampered youngsters arrive at realistic decisions about the greater world and their personal places in it. If the children's plans--or their parents' for them--seem unworthy of the school, it also seems as though the school is a better one than the parents require--or even deserve. There is little sign of strong parental interest in and support of the school's specific programs, other than a willingness to "spend money" on the general school budget. Hence we may hypothesize weak parental backing for school work as such and a lower efficiency of school programs than these programs would enjoy in some other environments.

At Junction City, a surprisingly well-designed school, yet with only two counselors for 800 students in a dying community, seems to invoke more fantasies than real future plans in the children. "I want to study piano in Ireland because I once read a story about a girl there and it was so romantic." It must be clear to the alert

in such a town that the development of useful personal skills (for immediate employment or for further education) represents the only escape from the local paralysis. This motivation, together with the departmental focus of the school's design, could well enhance the effectiveness of many of the school's programs. Yet the tensions and general depression of the expiring town clearly inhibit the realistic motivation and the healthy self-confidence of many of its adolescents.

Plainsville school, as a third example, is in a community both able and willing to provide its young people with an environment apparently more conducive to their growth. The school is strongly supported by the townspeople, both financially and, less directly, by the clear examples they offer of the various fruitful and rewarding adult roles to which their children might aspire. The single guidance counselor here may be sufficient, for a student need only keep his eyes open to see his several, alternative futures being lived out before him.

Yet this very richness of the local scene may have its less apparent disadvantages, which are no less real for being rather hidden. Riesman (1956, p. 121) has built a case for what he calls counter-cyclic education. As Riesman says, schools must offer something that the rest of society does not; that is why they are there. Where the school and the community are redundant, intellectual inbreeding and atrophy can set in. Yet the tension between the two dare not become a discord, lest the demand of one environment begin to supersede the other. If an equal respect for the claims of the real and the ideal marks both a sense of tragedy and of comedy, the same can in all likelihood be said for a community's schools.

A small town like Plainsville, in a sparsely settled area whose schools depend so heavily on the zest of local support, can hardly be expected to mount programs against itself in its local educational plant. Nor is there a college in Plainsville to enrich and broaden the students' sense of the many ways life may be led, apart from local mores.

Under these circumstances one could even hypothesize that the "at-homeness" of the students in their school and in their town, and the same "at-homeness" of each of these environments with the other, could make much of the school's program--especially those elements not directly concerned with comprehending local phenomena or preparing students for local jobs--appear irrelevant or even silly to many students and their families. In this preeminently happy place to live we could therefore imagine programs of less than superlative "professional" merit being accepted, even proudly, by an entire community whose self-esteem is as great as it is unchallenged.

Questionnaire and Test Data

The impressions developed as a result of the school visits were found to be generally consistent with the data obtained through

periodic administration of questionnaires and tests in the three schools and in the feeder schools from which the students come. On the other hand, there were instances in which the questionnaire and test data contributed insights not fully developed through the school visits. Details of the analyses of questionnaire and test data will be reported later; however, the general nature of the findings may be suggested through some examples.

The responses of eleventh-grade students to the Background and Experience Questionnaire reflected the community and school characteristics that were visible during the visits. For example, consider the responses to question number 125, "From the list below, which course of study are you taking in high school?" (Table 17).

Table 17. Percentages of Students Enrolled in Each Curriculum

	Richton	Junction City	Plainsville
Academic	56%	70%	65%
Business	32%	7%	3%
Vocational	9%	1%	21%
General and other	3%	15%	5%
Undecided	0%	6%	6%

In Richton, an efficient guidance program has channeled all students, many of them into the well-developed business and vocational programs. In contrast, the majority of students in Junction City are enrolled in the academic program with the general program enrolling the largest minority. The presence of the area vocational school in Plainsville is reflected in the 21% reporting enrollment in a vocational program.

Responses to question number 127 inquiring about the students' feelings about typing courses (Table 18), and to question number 130 concerning their interest in English courses, (Table 19), provide additional insight into the complexity of the curricular patterns. Junction City, for example, with most students formally enrolled in an academic program, has the largest percentage of students enrolled in typing, and a majority report that the courses are interesting. In contrast, Richton, with well-developed and sharply differentiated vocational and business curricula, enrolls a smaller percentage of its students in typing, and only a minority of these report that the courses are interesting.

Table 18. Students' Reported Interest in Typing Courses
(The figures in parentheses are percentages of those who did take typing)

	Richton	Junction City	Plainsville
Didn't take typing	44%	11%	38%
Boring	17% (30%)	21% (24%)	7% (12%)
Undecided	14% (25%)	13% (15%)	16% (25%)
Interesting	25% (45%)	53% (61%)	40% (63%)

The responses from Plainsville follow the participation pattern of Richton but the interest pattern of Junction City. Plainsville also occupies the middle position with respect to interest in English, with Richton students reporting high interest and Junction City students reporting low interest.

Table 19. Students' Reported Interest in English Courses

	Richton	Junction City	Plainsville
Didn't take English	2%	3%	2%
Boring	10%	24%	25%
Undecided	25%	34%	20%
Interesting	63%	37%	52%

The greater interest in English in Richton is also reflected in the answers to question number 92, "How often, on the average, have you read literary magazines such as Atlantic Monthly?" (Table 20)

Table 20. Students' Reports of How Often They Read Literary Magazines

	Richton	Junction City	Plainsville
Rarely or never	82%	99%	96%
Occasionally	10%	0%	4%
Regularly	8%	0%	0%

Even in Richton, however, the percentage of students engaging in literary reading is not large.

The more relaxed approach to school observed in Plainsville is supported by responses to question 97, "During grades 9 and 10, how long have you usually worked on school assignments during the evening?" (Table 21).

Table 21. Students' Reports of Time Spent on School Assignments

	Richton	Junction City	Plainsville
Seldom or never	6%	4%	8%
Less than one hour	18%	23%	32%
One hour a day or more	76%	71%	59%

The generally lower socioeconomic level of the Junction City community is reflected in responses to question number 123, "Do you have an encyclopedia at home?" (Table 22).

Table 22. Percentages of Students Reporting Having an Encyclopedia at Home

	Richton	Junction City	Plainsville
Yes	88%	80%	86%
No, but my parents have considered buying one	5%	3%	7%
No	7%	16%	6%

The overall impression gained from a study of the questionnaire responses, however, was that of great similarity among the three schools and communities. Index numbers[3] developed by weighting the percentage of responses to questions related to socioeconomic status and orientation toward education and adding the weighted percentages were very similar for the three schools. (Table 23).

Table 23. Index Numbers for Socioeconomic Status and Orientation toward Education

	Richton	Junction City	Plainsville
Education of parents (Questions number 113 and 114)	553	537	507
Rooms in home (Question number 117)	346	324	330
Bathrooms in house (Question number 118)	229	223	240
Parents favor more education (Questions number 120 and 121)	903	899	903
Parents show interest in school work (Question number 119)	416	415	414

[3]For example, for questions number 113 and 114 options A-G were weighted 1-7 and the index number was obtained by multiplying weights times percentages for both questions and adding the resulting numbers.

There may be striking differences in certain aspects of these three communities, but at least for the pupils who remain in school to grade 11, the cultural patterns are very much alike. The pressures of the urban ghetto or the rural slum are not a part of the experience of these children.

It is not surprising, then, to discover that the schools are more alike than different in performance on achievement tests in the STEP series. Mean scores for the three schools (and for children in grades 5, 7, and 9 of sending schools) are reported in Table 24. The ranges of mean scores and the averages of the mean scores for the three schools and for the schools in the STEP norms sample are reported in Table 25. It is evident that in comparison with the schools in the STEP norms sample, the three schools are quite homogeneous. Furthermore, they are distinctly above average in achievement in social studies and reading, and average in science. These relationships are further illustrated in Figures 21, 22, and 23 based on the data from the longitudinal samples, that is, on responses of students who were tested in grades 5, 7, 9 and 11.

Differences between the data from the longitudinal samples and the total group samples reflect a variety of possible effects, and the information necessary to distribute the various effects are not available. Some loss is attributable to population mobility, families move into and out of the community; some occurs because students were absent from school on the day the tests were administered. Students who were required to repeat a grade were lost from the sample, as were students who dropped out of school. It is possible, however, to look for relationships and to formulate tentative interpretations, particularly in the light of the data obtained from the school visits.

The school visits, for example, suggested that greater stability marked the Plainsville community than either the Richton or the Junction City communities, and the data of Table 24 are compatible with this conclusion. Fifty-six percent of the total fifth-grade group is found in the longitudinal sample for Plainsville. In contrast, only 48% of the total fifth-grade group for Richton and 37% for Junction City remain in the longitudinal samples. In both Richton and Plainsville, however, the number of eleventh graders is only slightly smaller than the number of fifth graders (133 vs. 149 for Richton and 115 vs. 125 for Plainsville). Apparently attrition is being balanced by an increase in the population of the community. In Junction City, on the other hand, there is a sharp decrease (203 vs. 139) in school population between grade 5 and grade 11. Either there is a high dropout rate or else the population of the community has decreased during the period covered by the longitudinal study.

Mean scores for the fifth-grade samples in the three schools, both longitudinal and total group samples, and the differences between the mean scores are reported in Table 26. In the case of Richton, the differences are relatively small, as would be the case

Table 24

Means, Standard Deviations, and Numbers of Students in Longitudinal and Total Group Samples in Three Schools (STEP Social Studies, Science, and Reading Tests)

Test	Grade	Richton						Junction City						Plainsville					
		Longitudinal			Total Group			Longitudinal			Total Group			Longitudinal			Total Group		
		Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N
Social Studies	5	255.6	7.7	71	255.1	11.0	149	259.3	13.6	76	253.8	14.2	203	257.4	16.2	70	253.8	14.9	125
	7	268.4	10.1	71	268.1	11.5	139	269.4	11.8	75	265.2	11.7	188	266.7	11.7	69	265.1	11.1	132
	9	274.3	12.3	70	273.7	13.6	138	278.9	13.4	76	273.4	14.2	208	275.3	15.1	70	274.2	14.0	138
	11	278.7	11.6	70	279.8	11.8	132	284.8	13.5	75	283.3	13.5	139	282.7	13.4	70	280.9	13.5	115
	11-5	23.1						25.5						25.3					
Science	5	253.5	10.1	71	252.6	11.2	149	255.1	12.3	76	250.5	11.9	202	252.9	12.5	70	250.0	12.4	125
	7	262.7	12.1	69	263.8	13.9	136	265.3	13.7	75	260.4	13.3	188	261.6	14.7	69	259.4	13.5	132
	9	271.9	13.7	70	271.7	15.0	138	276.8	15.4	76	270.6	15.8	211	273.7	16.3	70	270.9	15.8	138
	11	276.5	13.6	70	277.0	14.1	133	278.5	15.3	75	277.0	14.8	139	276.7	16.1	70	275.0	15.8	115
		23.0						23.4						23.8					
Reading	5	262.7	14.9	71	260.3	15.3	149	260.5	16.5	76	254.4	15.9	203	259.8	17.1	70	255.1	16.3	125
	7	275.3	15.1	71	275.0	16.7	139	274.3	16.8	75	268.0	18.6	188	269.4	20.8	69	266.4	19.7	132
	9	286.2	14.5	70	284.3	16.4	138	286.0	15.9	76	279.9	18.5	212	282.9	15.7	70	280.1	17.3	138
	11	296.4	14.4	70	295.5	15.6	133	295.6	17.1	75	294.2	16.0	139	290.6	21.3	70	289.6	19.9	115
		33.7						35.1						30.8					

Table 25

Ranges of Mean Scores on STEP Social Studies, Science, and Reading Tests for Three Growth Study Schools and for Schools in the STEP Norms Sample

Grade	Sample	No. of Schools	Social Studies			Science			Reading		
			Highest	Lowest	Average	Highest	Lowest	Average	Highest	Lowest	Average
5	Longitudinal	3	259.3	256.6	257.4	255.1	252.9	253.8	262.7	259.8	261.0
	Total Group	3	255.1	253.8	254.2	252.6	250.0	251.0	260.3	254.4	256.6
	STEP Norms	47	255.0	235.0	248.0	262.0	234.0	251.0	265.0	232.0	252.0
7	Longitudinal	3	269.4	266.7	268.1	265.3	261.6	263.2	275.3	269.4	273.0
	Total Group	3	268.1	265.1	266.1	263.8	259.4	261.2	275.0	266.4	269.8
	STEP Norms	47	265.0	240.0	255.0	272.0	242.0	261.0	282.0	240.0	263.0
9	Longitudinal	3	278.9	274.3	276.1	276.8	271.9	274.1	286.2	282.9	285.0
	Total Group	3	274.2	273.4	273.8	271.7	270.6	271.1	284.3	279.9	281.4
	STEP Norms	46	278.0	245.0	266.0	278.0	248.0	270.0	289.0	248.0	275.0
11	Longitudinal	3	284.8	278.7	282.1	278.5	276.5	277.2	296.4	290.6	294.2
	Total Group	3	283.3	279.8	281.3	277.0	275.0	276.3	295.5	289.6	293.1
	STEP Norms	44	285.0	253.0	273.0	287.0	263.0	279.0	302.0	258.0	287.0

Table 26

Mean Scores and Differences Between Mean Scores of Students in Fifth Grade Longitudinal and Total Group Samples in Three Schools

	Social Studies	Science	Reading
Richton			
Longitudinal	255.6	253.5	262.7
Total Group	255.1	252.6	260.3
Difference	.5	.9	2.4
Junction City			
Longitudinal	259.3	255.1	260.5
Total Group	253.8	250.5	254.4
Difference	5.5	4.6	5.9
Plainsville			
Longitudinal	257.4	252.9	259.8
Total Group	253.8	250.0	255.1
Difference	3.6	2.9	4.7

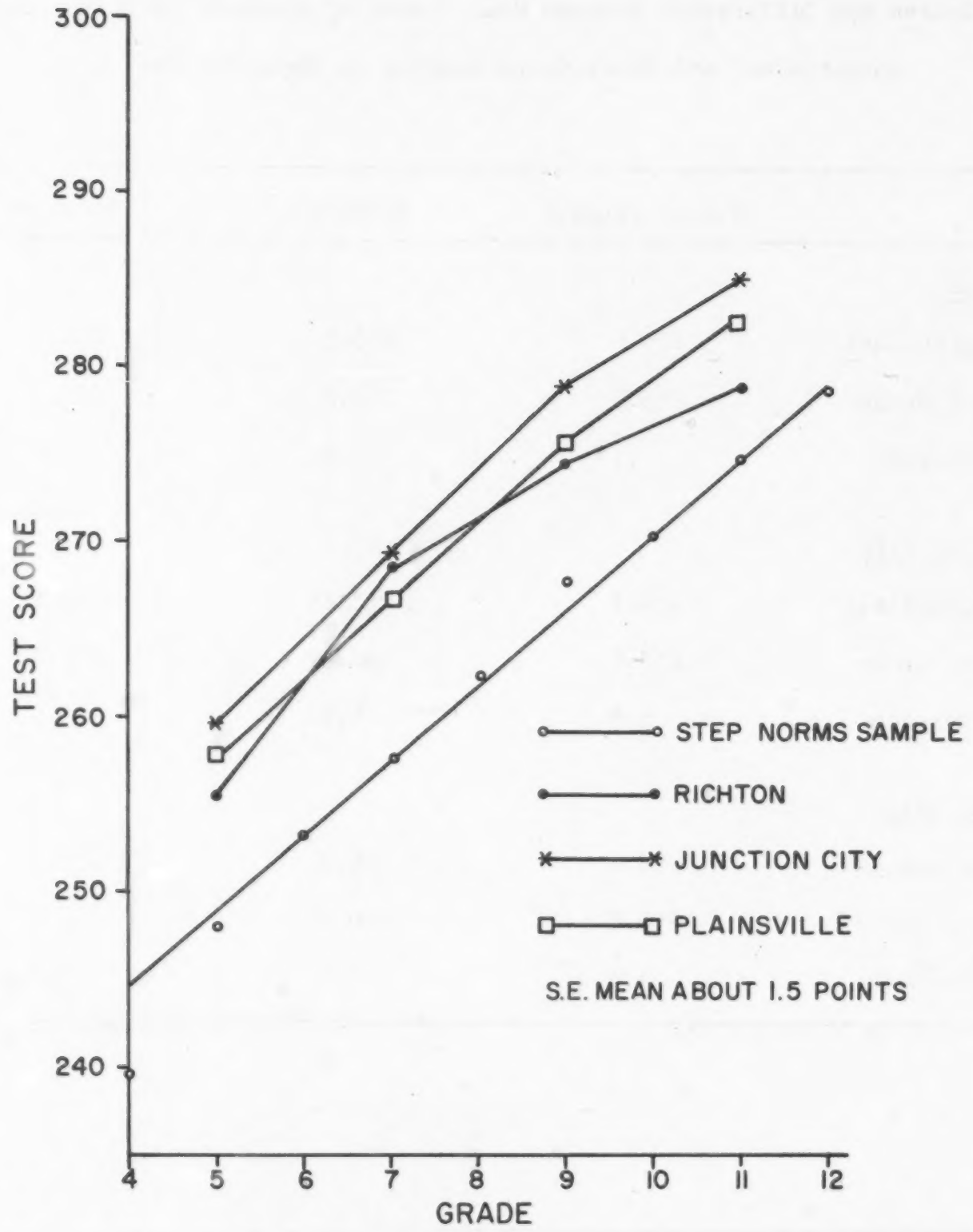

Figure 21. Mean STEP social studies scores for longitudinal samples in three school systems and for the schools in the STEP norms sample.

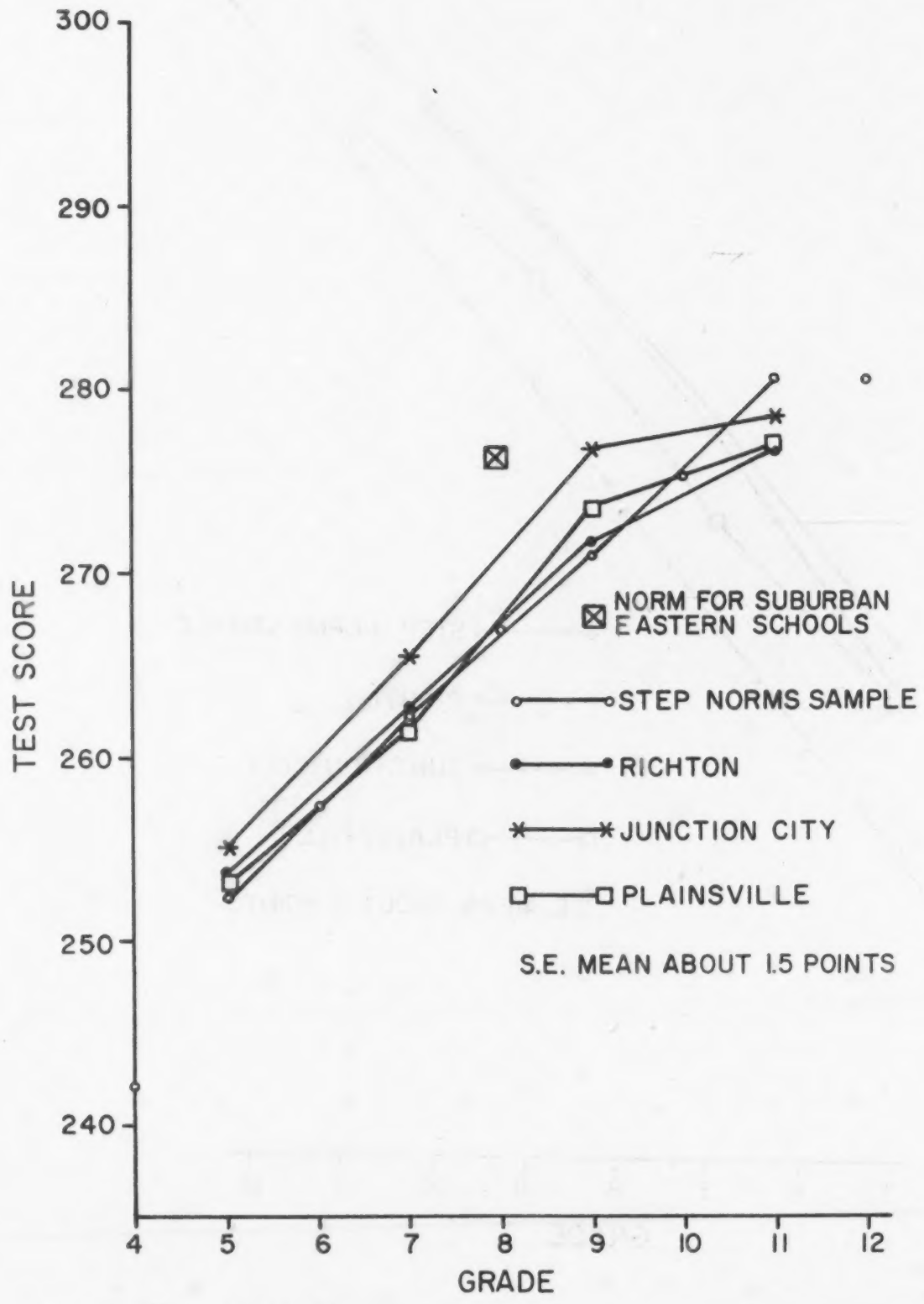

Figure 22. Average STEP science scores for longitudinal samples in three school systems and for the schools in the STEP norms sample.

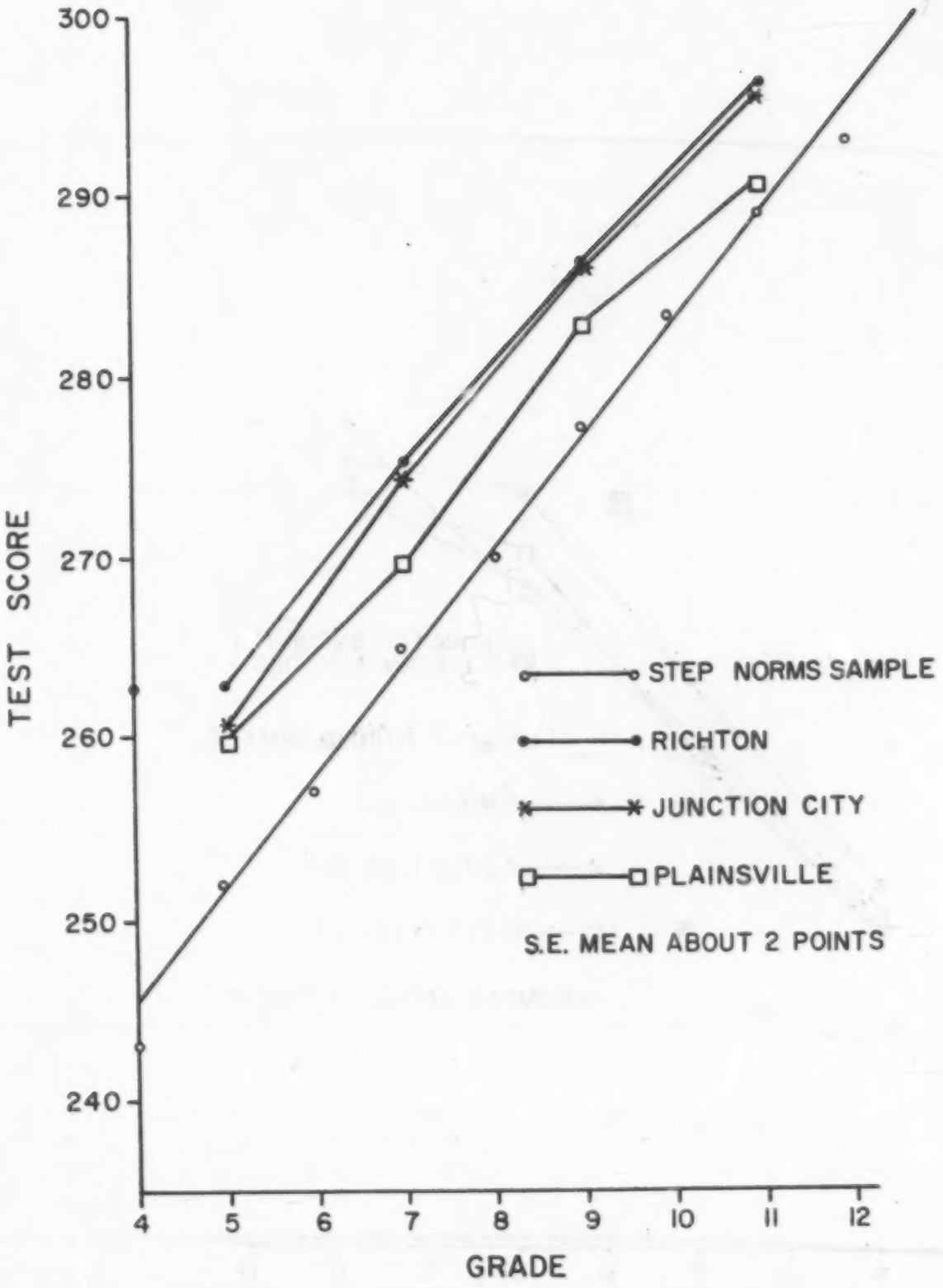

Figure 23. Average STEP reading scores for longitudinal samples in three school systems and for the schools in the STEP norms sample.

if loss of cases in the longitudinal sample were attributable to movement into and out of the community of families of similar background. In the case of Junction City, the differences are relatively large, as would be the case if loss of cases in the longitudinal sample were attributable to lower ability students dropping out of school before grade 11. The differences for the Plainsville samples fall between those for Richton and Junction City, as would be the case if only a few students of very low ability were dropping out of school.

An examination of the test data for the three schools generates more questions than answers. Apparently, Junction City achieves a high level of output by a process of attrition of students of lower ability. The extent to which this attrition is attributable to home influences or to school influences--or to an interaction of home and school influences--cannot be determined from the data now available. Perhaps the attrition is simply a reflection of the lack of opportunity for the youth of the community as they approach adulthood. One wonders, however, how the picture might change if Junction City were able to provide the type of differentiated program and the guidance available to the students in Richton. Perhaps the school in Junction City is reflecting in its own way the effects of lack of relevance that has led--in urban settings with larger concentrations of students who lack an academic orientation--to strong protests. If one looks only at test data for the group remaining in school through grade 11, the picture is a highly reassuring one. A close inspection of differences between longitudinal and total group data over time is certainly less reassuring.

Summary and Conclusion

Obviously, our evidence is limited. We must spend much more time at individual schools, observing and talking with students, teachers and administrators before we can compare the relative effectiveness of programs in developing either cognitive growth or the attitudes and skills necessary for effective adulthood. It is particularly important in making statistical comparisons between schools to remember that only about half of the students who were tested in the fifth grade appear in the eleventh grade sample. There are a number of reasons why this is so. In spite of the fact that all the communities that were visited were relatively stable, some students do move away or transfer to private schools.

Other students do not move through the system at the normal rate. Their progress is impeded by illness or academic failure. We do know that no school in our sample reports more than a 6% loss during the three or four years covered by that school of students who seek no further education of any kind. And we know that all these schools are trying hard, with increasing success, to lower this "true" dropout rate.

There are several ways of holding students in school, such as switching them to less demanding curricular programs or providing them with tutors. All our informants agreed, however, that co-operative education programs, which give students work experience in the larger society as well as in the school environment, are particularly effective for accomplishing this end. Whether students build a house, raise prize steers, work in hardware stores or bakeries, the experience seems to foster the development of skills and attitudes which as A. D. C. Peterson (1968, p. 8) says, "Enable most men and women to play their appropriate part in society...and at the same time to realize their best selves." Often for the first time in their lives students find the relevance of their academic courses to their lives in the larger society. They are not taking Math I because it's a prerequisite for Math II. They are learning mathematics in order to compute the number of board-feet necessary to complete a floor, or trigonometry and physics to enhance their skills as millwrights. Nor are they moving through four years of English in order to have the proper number of Carnegie units to fulfill college entrance requirements. They are studying English to increase their reading comprehension and their written and verbal communication--in order to deal effectively with business associates and customers. They are learning the fundamentals of research and of writing technical reports in order to increase their competencies in their chosen fields--"The Fundamentals of Hand Care Including Diseases of the Nail," "The Evolvement of an Automatic Transmission," "Safety Factors in Scuba Diving."

Having examined three patterns of relationships between schools and the larger society in small, relatively self-contained communities, we might summarize our tentative conclusions about the relationship of any school's program and its actual impact on the students:

(1) A school in a community where the parents are not truly concerned with education will find its programs, however well-conceived, less effective than they might otherwise be.

(2) A school in a depressed or declining community may count on strong motivation for learning in some cases--as a way of getting up and/or out--but may also suffer unrealistic student concepts of themselves and their later careers.

(3) A school which is too indistinguishable from its local community--its values and aspirations--finds it easier to obtain tax support than to enlarge and complicate its students' visions of the world. It merely mirrors the values of the community. Yet, whatever the possible limitations of the students' sophistication and test scores, their self-confidence may well ground them more firmly and take them further than would academic achievement won in more sophisticated or in more desperate spots.

Chapter 8

Negro-White Differences in Adolescent Educational Growth[1]

Michael Rosenfeld and Thomas L. Hilton

The past 50 years have seen considerable consistency in published research concerning Negro and white differences. The results generally indicate that average scores made by Negro groups on intelligence tests are consistently and significantly lower than those made by white groups in the same communities (e.g., Coleman et al. 1966; Tyler, 1956). Almost all of these investigations, however, have been cross-sectional in nature--an approach involving testing samples of subjects at each grade or age level at one point in time. A nationwide study of this type was conducted by Coleman in 1966. He reports that whites scored higher than Negroes in each region of the United States, and at each grade level investigated. In addition, he found that test score differences between Negro and white students were greater at grade 12 than those initially present at grade 1. These results are fairly typical of cross-sectional findings, and are frequently cited as evidence of differential rates of intellectual growth for Negro and white students.

Whenever growth rates are estimated from cross-sectional data, however, there is always the possibility that differences observed are attributable to uncontrolled sample differences (e.g., more dropouts in one sample than the other, Hilton & Patrick, (1970). The obvious answer is longitudinal data, i.e., data from repeated measurement of the same subjects at different points in time.

Few longitudinal studies of Negro and white patterns of intellectual growth have been reported. One such study by Osborne (1960) compared the arithmetic and reading skills and mental maturity of white and Negro children in a southeastern state. On all measures, the Negro students were below the white students at the sixth grade level and the gap increased from the sixth to the tenth grade. For the Negro group, achievement and mental maturity showed little or no increase from the eighth to the tenth grade. One wonders, however, to what extent the educational treatments were equal; presumably the Negro and white schools were separate. Secondly, it is likely that in grades 9 and 10 a much higher proportion of the white students than Negro students were enrolled in academic (college preparatory) programs as opposed to non-academic (vocational) programs. Assuming that the academic programs provide

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[1]This chapter is a revision of a paper presented in a symposium entitled "Explorations in Vocational Development and Education" at the Seventy-Sixth Annual Meetings of the American Psychological Association. The authors are indebted to Charles E. Hall who conducted the data analysis.

more formal instruction in traditional academic subject matter, students enrolled in such programs should display higher scores on conventional academic achievement tests, regardless of race.

The study reported in this chapter was designed to compare, longitudinally, the academic growth of Negro and white students who attended the same high schools and were enrolled in the same curricula. It also investigates the relationship of a measure of socioeconomic status (SES) to academic growth.

Method

Subjects in this study consisted of 817 students (316 Negro and 501 white) for whom complete Growth Study data were available for each variable in the study for the grades noted. They were selected from six high schools in two cities--one Midwestern and one Western. The proportion of Negroes in the six schools ranged from 10% to 90% of the student bodies.

The requirement of complete data necessitated both continued attendance in high school as well as stable residence in the communities included in the investigation for a seven-year period. Thus the subjects in this study, particularly the Negro group, represent a selected sample.

To ascertain just how different the study subjects may have been from the total sample of students attending the schools in question, the means in Table 27 were computed. When SCAT and STEP were administered at the grade 11 level, all of the students attending the schools took the tests whether they had participated in the study previously or not. These data provided the "full sample" means and standard deviations. The surprising fact is that the means and standard deviations for the study sample do not differ appreciably from those of the full sample, suggesting that the study sample was more representative of the students attending these schools in the eleventh grade than one would think in view of the large reduction in the sample resulting from the requirements of the longitudinal design.

Table 28 provides a description of the two samples in terms of the SES of the students' parents. SES was computed by summing the level of each parent's education, the occupational level of the family's main provider, and the number of bathrooms in the student's home or apartment. A score of 11, for example, might indicate that each parent graduated from high school, that the father was a technician or perhaps a salesman, and that they had one bathroom in their home. On the average, the study subjects might be described as middle class or lower middle class, roughly speaking.

A multivariate analysis of variance program (MANOVA) devised by Clyde, Cramer, and Sherin (1966) and modified by Hall (1967) was used in the analysis of the data. This program not only provides relevant F ratios but also performs a discriminant function analysis

Table 27

Comparison of Mean Grade 11 SCAT Verbal Scores of Study Sample and Full Sample

Town A

	Academic						Non-academic					
	White			Negro			White			Negro		
Boys	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Study Sample	97	289.5	13.3	25	281.3	10.9	52	278.0	15.4	43	264.6	13.6
Full Sample	135	290.5	13.0	45	280.2	12.5	87	276.0	15.6	120	263.7	12.9
Girls												
Study Sample	122	292.3	13.9	31	278.9	13.9	56	280.0	15.0	54	263.3	10.3
Full Sample	178	292.2	13.7	63	277.6	12.1	95	280.8	15.8	130	261.3	11.7
Subtotal												
Study Sample	219	291.0	13.7	56	280.0	12.8	108	279.0	15.2	97	264.0	11.9
Full Sample	313	291.4	13.5	108	278.7	12.4	182	278.5	15.9	250	262.4	12.3

Town B

Boys	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Study Sample	49	295.0	11.2	21	278.6	12.8	41	276.2	11.2	53	268.5	11.1
Full Sample	78	292.6	12.0	33	279.3	12.7	81	277.0	11.1	107	268.6	10.4
Girls												
Study Sample	46	291.6	10.5	27	284.1	11.9	38	275.9	10.3	62	269.0	11.6
Full Sample	73	291.6	11.0	38	280.2	12.5	76	275.5	10.3	112	266.7	11.4
Subtotal												
Study Sample	95	293.4	11.0	48	281.8	12.6	79	276.1	10.8	115	268.7	11.4
Full Sample	151	292.1	11.6	71	279.7	12.6	157	276.2	10.8	219	267.6	11.0

Town A and B combined

Study Sample	314	291.8	13.0	104	280.8	12.7	187	277.8	13.6	212	266.0	11.9
Full Sample	464	291.7	12.9	179	279.0	12.5	339	277.4	13.8	469	264.9	12.0